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# East Europe Report

## SCIENCE AND TECHNOLOGY







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# EAST EUROPE REPORT

## SCIENCE AND TECHNOLOGY

## CONTENTS

# MICROPROCESSORS IN GEOPHYSICAL INSTRUMENTS DISCUSSED

Prague RUDE PRAVO in Czech 12 Sep 84 p 4

[Article by Z. R.: "Microprocessors in Geophysical Instruments" under the rubric "Precision Research"]

[Text] Microprocessors are used in geophysical instruments employed in prospecting for deposits of mineral raw materials. Such processors decrease the size and weight of the instruments and their energy use.

The first microprocessor instrument--the KT-5 capameter, which measures the magnetic properties of ores directly in the field--is now being manufactured in quantity by the Geofizyka National Enterprise in Brno. It has met with success on the domestic and the foreign market, since it is 10 times as sensitive as its closest foreign competitor, manufactured in Canada.

Experience in the manufacture of the microprocessor capameter has made possible the rapid development of dozens of other geophysical instruments. Five of these are manufactured by Geofizyka, five by other firms around the country, and others will be used only within an enterprise.

Among the latest instruments is the GS-256 gamma spectrometer, which analyzes the radioactivity of ores. This, too, is based on a microprocessor. A new concept has made it possible to give it parameters of a quality not yet found in any similar instrument anywhere in the world. It is worth noting that after measurements have been completed, it calculates the concentrations of potassium, uranium and thorium, keeps a numerical record of several measurements daily, and has connections for various peripheral devices, such as computers or small calculators. All of the important functions are under the control of a microcomputer, as is the proper functioning of the operator. The GS-256 gamma spectrometer was the focus of interest at the instrumentation exhibit of the Society for Exploration Geophysics in Las Vegas and at the August World Geological Congress in Moscow.

This new series of microprocessor geophysical instruments is raising the quality of measurements. It is simplifying the work of operators and eliminating the need for manual data processing. All of this will result in improved information quality and will be reflected in the next stages of prospecting for deposits and in the lowered cost of raw materials.

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NUCLEAR REACTOR VVR-S SERVES SCIENTIFIC RESEARCH

Prague RUDE PRAVO in Czech 3 Oct 84 p 4

[Article by Eng Milan Capek: "Nuclear Reactor VVR-S Serves Practice" under the rubric "Science and Research"]

[Text] The VVR-S nuclear reactor is both the largest experimental installation of the Institute for Nuclear Research in Reza and the largest neutron field irradiator in the CSSR. It was provided by the Soviet Union within the framework of an agreement on collaboration in the peaceful use of atomic energy, and since beginning operation (24 September 1957) it has been serving the needs of Czechoslovak research and the national economy.

The VVR-S is a universal heterogeneous research reactor using thermal neutrons. Ordinary water serves as the moderator and coolant. At present it is using type IRT-M fuel rods, supplied by the USSR, enriched with 80 percent uranium 235, which means that it can operate at a power output of up to 10 MW. It serves as a source of radiation for irradiating [objects] in high-energy neutron fields or for making measurements with neutron beams which it produces.

Irradiation is performed in irradiation apparatus (loops or pits) which imitate the physical conditions of nuclear power plants, or in standard irradiation containers.

At the current stage of development of nuclear power, radiation is being used to study the radiation stability of reactor materials, in particular the effect of neutron bombardment on the mechanical properties of steel used for reactor pressure containers. The irradiation of samples of materials used for pressure containers of the Paks electric power plant and for the VVER-1000 has provided data on the suitability of the materials used and information used in their manufacture. Attention is currently being focused on developing new types of steel which can meet the comprehensive requirements for use in nuclear power plants.

The chemical regimens of reactors are being investigated in the RVS-3 aqueous loop, installed in the active zone of a reactor. Research is

providing information useful in the operation of nuclear power plants, and is providing suggestions for an optimal regimen, from the viewpoint of corrosion.

Irradiation in standard ceramic containers meets both the requirements of the various departments of the Institute for Nuclear Research and those of clients outside of the institute. The most frequent user within the institute is the Department of Radiopharmaceutics, which regularly irradiates both a broad range of common materials used in the manufacture of radionucleotides, and molybdenum, used in the manufacture of technetium generators. At present, molybdenum is the most widely used radionucleotide in nuclear medicine. It is used diagnostically, in pertechnate injections, or for labeling compounds having a suitable biological activity, since it provides very high quantity diagnostic information with little disturbance to the organism. Every year in the CSSR more than 300,000 examinations are performed using radionucleotides at more than 50 laboratories of nuclear medicine. Of all radiopharmaceuticals used, 39 percent are manufactured by the Institute for Nuclear Research, with a value of over Kcs 8 million (figure for 1982), and this figure is expected to rise.

Other customers for the products of the reactor are laboratories which use activation neutron analysis for the determination of trace elements. This technique is used most frequently in geology to analyze large numbers of ore samples from geological bore holes or the ocean floor, or even samples of extraterrestrial origin, for example, moon rocks. In industry, neutron activation analysis is used in the manufacture of pure materials, to determine the transition of a lining material to steel in the melting process, to analyze for the presence of hafnium in zirconium, of palladium and platinum in catalysts (contributing to the rational use of these rare metals), and of uranium in geological and biological samples, etc.

In the area of nutrition, neutron activation analysis is used, for example, to analyze for elements in the tissue of suckling pigs (which can in the long run bring about an increase in the production of pork), for mercury in flour from treated and untreated seed, for trace elements in flour and blood, etc.

In the area of hygiene and medicine, neutron activation analysis can be used to determine the level of uranium in the blood of workers in the uranium industry (the results obtained were used in developing proposals for the modification of working conditions for uranium workers), of isotopes of zinc and copper in the nervous system of rats afflicted with carbon disulfide neuropathy (the results contributed to the formulation of a hypothesis on the mechanism of carbon disulfide poisoning), of arsenic in the skin of cancer patients, etc. The method of determining arsenic in hair was used to analyze Napoleon's hair to show that he was apparently not poisoned.

In industry and research much use is also made of procedures based on the easy identification of radionucleotides in a wide vareity of media. For example, irradiation of the balls used in ball bearings or piston rings makes it possible to evaluate different operating conditions of entire

machines (this method was used to test new types of Skoda automobiles). Radionucleotides can be used to follow the passage of materials through rotary kilns and mills and continuous kilns, the homogeneity of diffusion of additions in metal alloys, sources of contamination in underground water, etc.

Nuclear reactors can also be used to induce atoms of type p in monocrystalline semiconductors used in the manufacture of semiconductor components. A special rotary channel is installed in the reactor, making possible the homogeneous irradiation of monocrystals and the production of high-quality materials which cannot be obtained by traditional methods. Every year hundreds of kilograms are produced, and in future this figure is expected to be measured in tons. The parameters of the semiconductors produced from irradiated monocrystals are the same or better than those of materials manufactured by traditional methods.

The VVR-S reactor is equipped with horizontal channels, which are used primarily for the installation of equipment for basic research. One channel contains apparatus for neutronography, a radiographic method similar to roentgenography, in which neutron beams are used as the penetrating radiation. Neutronography either supplements information obtained through the use of x-ray analysis or provides new information, for example in the case of radioactive objects, light hydrogen materials, and certain particularly dense materials such as uranium, bismuth, tungsten, etc. In practice, neutronography is used for the defectoscopy and analysis of fuel rods of nuclear reactors, ammunition, space-rocket charges, electrical engineering units and radioactive radiators, for diagnostic purposes during surgery on bone tumors, for archeological diagnostics, etc.

The ninth horizontal channel of the reactor (about 1 m in diameter) is used for biological research. Work is currently in progress on neutron beam irradiation of brain tumors. The channel is also used for irradiating mockups of the shielding of a fast reactor. This work is being carried out in collaboration with the USSR and is paving the way for a new stage in the Czechoslovak nuclear power industry.

The VVR-S reactor was put into operation in 1957 and is continually being modified to meet the demands made on it. Much work is being done on increasing the quality of irradiation, primarily by increasing the density of neutron fluxes. After reconstruction in 1978, which made it possible to use IRT-M fuel rods and to increase the density of neutron fluxes by a factor of 10, there have been ever-increasing demands on irradiation to contribute planned innovations of the reactor, remodeling it into an LVR-15. An increase in the number of cells in the separator of the active zone and an increase in the heat output will lead to a further increase in irradiating capacity. Innovations will make easier and safer irradiation possible and will lead to an increase in overall operational safety. It is expected that the reactor will still be able to serve us after the year 2000.

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## CHEMICAL, MATERIAL ELECTRONICS STUDIES ESTABLISHED

Prague RUDE PRAVO in Czech 3 Oct 84 p 4

[Article by Prof Eng Lubomir Hudec, Dr Sc: "To the Aid of the Development of the Electronics Industry"]

[Text] Contemporary technical development throughout the world is leading to the electronization and robotization of all social activities. The Czechoslovak public is aware of the inevitability of this process, which is affected above all by the development of the components base. The size of already miniscule electronic components structures and integrated microelectronic and optoelectronic circuits is being further reduced in order that the resulting component might be able to carry out an increasing number of necessary functions, and do an ever better job of satisfying the needs of society and the individual. This implies a much stricter demand for purity and perfection in atomic energy construction and in the properties of all the materials used in the manufacture of microelectronic components.

For these reasons, Czechoslovakia too must make a transition to the systematic construction of a materials base for the microelectronic and optoelectronics industries, and to the education of university-trained specialists and scientific researchers. The chemical industry is doing the same. There are still, however, a large number of important unsolved problems in the area of developing chemical processes for the creation of new and suitable materials and structures.

The need for studying internal processes in materials will become clear from an example. In an ordinary large electronic component, such as the familiar transistor, a small flaw or unwanted impurity will only lower its quality, without having any substantial effect on its function. When complex microelectronic circuits are manufactured, however, an unwanted impurity can cause serious problems, generally the disruption of some part of the circuit and thus the disruption of some required function of the device. Such defects and material disorders must obviously be kept to a minimum, as regards both size and number. We must improve the technologies for the manufacture of superpure materials for use in the electronics industry. We must train specialists able to meet these demands, not only in the immediate present but in the more distant future. The level of technology

of the manufacture of materials for the electronics industry must keep pace with the demands of components manufacturers.

This is why the Federal Ministry of the Electrical Engineering Industry is calling for the training of college-educated specialists able to make these schemes a reality. Since the beginning of the 1984-1985 academic year, the Faculty of Chemical Engineering of the College of Chemical Engineering in Prague has been offering a 5-year interdepartmental program in chemical and material electronics engineering, supported by the recently established chair of chemical materials engineering for electronics.

The plan is to educate a chemical engineer (or technologist) who will be familiar with the problems of the manufacture, special measurement and use of materials and structures for electrical engineering and electronics, and who will be able to solve high-level problems on materials with extreme parameters used in the development of future generations of electronics components. Graduates of the interdepartmental program will find employment primarily in the so-called small-scale chemical industry, not only in the preparation of materials for electronics but also in the preparation of special high-quality materials in general.

This is a highly attractive and interesting area of science and technology, and specialists in this area are sought after by industry and by scientific research institutes throughout the country.

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# STATE SECRETARY SPEAKS ON GDR-USSR SCIENTIFIC COOPERATION

East Berlin INFORMATIK in German Vol 31 No 4, 1984 pp 1-2

[Interview with Klaus Stubenrauch, State Secretary, Ministry for Science and Technology: "Scientific Potential of the USSR and the GDR Is Closely Interconnected"; date and place not specified]

[Text] INFORMATIK: How has GDR-USSR scientific cooperation developed in recent years, and what are its most outstanding results?

Stubenrauch: In recent years cooperation with the USSR has extended to all sectors of our national economy. By now our material and intellectual potentials are interconnected more tightly than ever before. Not a single link in the chain is excluded--from basic research via technical development through production and the exchange of goods. The latter, in particular, demonstrates a steady dynamism and is largely due to the results of research and development as applied in practice.

The development and structure of our republic's research and production potential is essentially defined by the program on specialization and cooperation of production through 1990, adopted by our two countries. Currently almost 200 agreements at government and ministerial level reflect our close scientific-technological cooperation with the USSR. Firm arrangements for cooperation in every single sector are directed to the greatest possible national profit and mutual benefit. So far roughly 500 common patents are bearing witness to the growing creative standard of cooperation. In addition more than 4,000 uniform standards serve to deepen specialization and cooperation in production and contribute to the improving quality and reliability of products. More than half our entire goods exchange with the USSR is accounted for by products based on uniform standards.

Of late, cooperation has increasingly featured the fact that key technologies--which largely affect the intensification of our entire national economy--are the focus of joint scientific-technological efforts. This includes the more advanced processing of raw materials and other materials, the wide-ranging application of microelectronics and robot equipment.

Among the outstanding results of our scientific-technological cooperation with the USSR are the development and testing of new research equipment within the framework of the INTERKOSMOS program. Still, progress is made in other fields also. Last year, for example, joint efforts for the development

of microelectronics yielded more advances in the manufacture of new and high-precision equipment. At this very moment, concrete programs on robot equipment are being realized in 28 fields.

In the field of the chemical industry, for example, further intensification effects were achieved by the jointly developed and constructed Polymir plants in Novopolotsk and Leuna, within the framework of the government agreement on high-pressure polyethylene on the basis of science and technology. The capacity of the plants rose by 20-25 percent, hand in hand with growing materials and energy savings, because some processing stages were either eliminated or coupled to better effect.

INFORMATIK: Where do we see reflected the coincidence of the main lines of economic development in our republic and the Soviet Union with the key points of cooperation in sciences and technology?

Stubenrauch: We are currently engaged in coordinating the main orientations of scientific-technological cooperation through 2000 and the basic topics for the next five-year plan. Up to now there has been a great deal of agreement on the most important trends. In their cooperation, both countries are uncompromisingly emphasizing top scientific-technical standards, the best possible quality of reciprocal goods deliveries, the creation of technological prerequisites for appreciable advances in energy, raw materials and other materials conservation, deepened specialization and cooperation related to new machine and appliance systems by the use of uniform and progressive standards. Important also is cooperation in the rationalization and reconstruction of production plant, in particular for food and consumer goods.

The following examples will indicate the sectors mainly involved. First: The development of the GDR's energy base as well as processes and equipment for the more advanced processing of raw materials and synthetic materials have been much emphasized in our earlier cooperation. At the present time we are jointly working on the basis of brown coal to significantly lower specific fuel consumption for heat and electricity production at the 500-megawatt power plant blocks imported from the USSR.

The improvement of the performance standard in the metal processing industry offers another example demonstrating the coincidence of economic development and the corresponding scientific cooperation by our countries. The trend to new equipment and progressive automation to the point of flexible production requiring few operators determines the basic outline of our joint long-range cooperation. This is very important indeed for the export of the products of the GDR metal processing industry to the Soviet Union. At a symposium held in early April last, scientists from both countries discussed the principal directions for work in this field. Earlier, at its 35th meeting late last year, the Parity Government Commission on Economic and [line missing in original--translator's note] between the GDR and USSR adopted new projects involving the common development of highly productive processes and technologies in processing metallurgy.

Thirdly, we maintain a lively exchange of experiences with the USSR with respect to fuel, energy, raw materials and materials management. Based

on fundamentally the same scientific-technological and economic approach, definite assignments for cooperation have been prepared. We are endeavoring, for example, to achieve greater energy efficiency of industrial furnaces. In addition we are also concerned to jointly recover metals from waste products.

Other crucial fields for building up or expanding cooperation are represented by such key technologies as biotechnology and the development of new metallic and polymer synthetics.

INFORMATIK: What types of scientific-technological cooperation have been demonstrably most efficient?

Do they include training and the reciprocal exchange of scientists?

Stubenrauch: Many different types and methods are employed. Priority remains with cooperation on research, development and testing. The agreements at government and ministerial level, mentioned earlier, arrange for joint work and the planned division of labor in research and technology, in order to achieve the established objectives with the greatest possible efficiency. Such agreements were concluded for the coordinated development of entire industrial branches, such as microelectronics, computer technology and nuclear energy--also for the development of technological processes. These include, among others, processes for loaded plastic materials, crude rolling processes, the use of super hard materials. The reciprocal exchange of scientific-technological results has increased significantly on the basis of commercial contracts.

Of course cooperation with the USSR includes the training of scientists and long-term cooperation in clearly defined research collectives of the partner country. Up to now 17,600 young GDR citizens completed their undergraduate or graduate studies at Soviet universities and colleges. In recent years, scholars of our republic have steadily collaborated with Soviet research specialists at such internationally renowned institutions as the Institute for Physics at the Academy of the Siberian branch of the USSR Academy of Sciences or the All-Union Research Institute for Synthetic Resins in Vladimir. New recipes for and products of polyurethane chemistry represent one result of the close cooperation between a German-Soviet research collective in Vladimir with the Schwarzheide Synthetics Plant VEB and other partners.

In the first stage of cooperation, the emphasis was mainly on technical aid and the reciprocal exchange of specialists. Now we are concerned with the interconnection of our scientific potentials for the settlement of complex problems, and this kind of scientific-technological cooperation features coordination, cooperation and the joint conduct of research and development as well as the exchange of completed results on a contractual basis. Objective and target at all times decide the kind of cooperation involved.

In general, though, it is important for the efficiency of joint efforts, that a scientific-technical top standard should emerge, coupled with the

optimum cost/profit ratio in production, that cooperation cuts the time needed for production maturity, and that the research and development results are quickly and widely applied. Production specialization and cooperation present us with many opportunities.

INFORMATIK: GDR-USSR scientific-technological cooperation is quite ubiquitous. Does it also include exchanges of experience among scholars of both countries with regard to the intensification of research itself?

Stubenrauch: The exchange of experiences relating to the intensification of research is important for the efficiency of our cooperation. It begins with joint forecasting assessments and the drafting of the key points of scientific-technical development as well as their solution by stages as the result of common efforts. It continues with the exchange of perceptions, by way of the capacities used and the time needed to accomplish concrete assignments and extends to reciprocal obligations arising from agreements on research cooperation and the provision of the material resources required therefore, in particular equipment, laboratory and testing facilities.

The automation of scientific experiments by the use of microprocessors is an important agreed orientation. We have achieved advanced division of labor with respect to the evaluation and availability of scientific-technical data, for example. Already we are exchanging taped informational services relating to entire special fields. This includes "Chiminform," a service that rapidly supplies the latest data to the chemical industries of the two countries. This enables us to significantly reduce the time needed by scholars to comprehensively search the relevant literature before tackling a research and development assignment. It is our intention in the coming years to gradually set up data banks and make them automatically and reciprocally available.

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## ROBOTICS RESEARCH, INTEGRATION OVERVIEW PRESENTED

### Application Objectives Cited

East Berlin VOLKSARMEE in German No 5, 1984 (signed to press 30 Jan 84) p 11

[Article signed 'G.K.']

[Text] Presently, rationalization processes are being adopted in all areas of our economy through which highly productive methods of great economic utility are taking hold, based on the application of industrial robots whose count is approaching 30,000. The industrial robot is thus becoming the dominant rationalization vehicle in structuring automated production processes and linking machines and facilities. Finally, it is a matter of, according to Comrade Erich Honecker at the Seventh SED Central Committee Convention, "accelerating the entire production cycle." And he underscored yet another aspect in the use of robotics: "Above all, however, we are thinking of the workers who will be freed in building the tools of rationalization,in manufacturing consumer goods and export products and in executing many other tasks."

Robots are program controlled automats or highly specialized machines which have, among others, the task of simulating the movements of biological systems, especially the motions of the upper and lower human limbs.

Industrial robots of the first generation can execute an arbitrary sequence of independent movements through flexible, articulated joints, thus making possible the manipulation of parts and tools. The next step, the second generation, is characterized by the application of sensors for tactile and visual functions and leads to the third generation with a comprehensive sensor system and artificial intelligence employing microcomputers with microprocessors and freely programmable memories and numerical control techniques. As a consequence, these robots can even now imitate elementary functions of the human brain. They can sense and learn.

### Increasing Use of Second Generation

East Berlin VOLKSARMEE in German No 5, 1984 (signed to press 30 Jan 84) p 11

[Article by Dr Josef Morgenthal, Deputy Minister of Electrical Engineering and Electronics]

[Text] At the Seventh Convention of the SED Central Committee, the importance of industrial robotics for the acceleration of scientific-technical progress and its

economic exploitation was emphatically underscored. All areas of industry are responsible both for expanding the use of robots and for cascading the effects of their application.

The electrical engineering and electronics branch of industry is doubly involved with the task assignment in the area of industrial robot technology ratified by the Tenth SED Rally: We have to supply to other economic sectors important components for manufacturing robots, such as microelectronic controls from the VEB Numerik "Karl Marx," specified power units from the VEB Kombinat Elektromaschinenbau and instrumentation systems from the Kombinat VEB Carl Zeiss Jena. At the same time we also have to manufacture the major part of the robots required by us in our combine's own rationalization tool building program.

For several years we have been successfully employing industrial robots. Previously, the machines and equipment units involved in the basic technological operations of serial production were automated stepwise; now, other technological tasks such as loading, unloading, transporting and inspecting can be linked and automated with the aid of industrial robots. This complex application of robots yields important economic and social effects. As an example, in watch manufacturing in the VEB Kombinat Mikroelektronik, 27 process specific industrial robots took over the monotonous labor of about 100 workers who were then transferred to new, more challenging jobs.

In our area, a successful procedure has been to concentrate industrial robots primarily in departments doing three-shift prefabrication jobs and in die-casting and injection-molding foundries. Accompanying this is a growth in the potential for unattended operation. An example is provided by the VEB Plastelektronik Kamenz. By employing robots, the injection molding process could be automated, resulting in unattended operation on the night shift and a rolling shift on weekends.

We view it as an important task to employ robot groups in assembly departments. In line with this, the VEB Elektrogeraetewerk Bad Blankenburg plans to restructure the component assembly of air cleaners and employ three industrial robots. This action will free seven to eight workers for other jobs.

The integrated application of industrial robots for low man-power, flexible automation is taking on increasing importance. The first examples of this were created in the electrical engineering and electronics branch of industry, which includes the fabrication of worm-screw drives in the Kombinat VEB Carl Zeiss Jena. Here ZIM-60 industrial robots are used for loading in two manufacturing cells which also include modernized machine tools and an automatic transport system. Goods production was substantially increased; and for each robot, 8.5 workers could be freed for new tasks.

Another important task which takes into account the increased demands on production flexibility, technological stability and reliability consists of broad-based utilization of process-flexible robots and industrial robots of the second generation. Cited as an example of this is a pilot solution developed in the VEB Relaistechnik Grossbreitenbach. In cooperation with the Ilmenau Technical University,

an industrial robot of the second generation for the automatic installation and adjustment of relays was developed and applied with high effectivity. It was possible to free more than 30 workers for other tasks.

## Sensor Systems Research

East Berlin VOLKSARMEE in German No 5, 1984 (signed to press 30 Jan 84) p 11

[Interview with Evelyn Koepke, OSTSEE ZEITUNG reporter resonsible for robotics developments, by Lt Col Jabs]

[Text] Hello, Comrade Evelyn Koepke, you are always on the look out for robotics innovations for the OSTSEE ZEITUNG, what have you come up with lately?

Sensors, eyes for robots.

Can you tell us something about them?

Gladly. First to mention would be a youth research collective of students from the naval engineering section of the Wilhelm Pieck University, Rostock. The group developed, under the direction of Prof Fiedler and Dr Wild, a "sensor-controlled welding robot." It is heat resistant and so small that it can guide the torch into all angles and corners.

And it really works?

But of course. It has demonstrated its complete functional capability at the Warnow ship yard. It fully satisfies the high requirements on stability, reliability and intelligence.

What else do you have to offer?

An eye for robots from scientists, engineers and students of the Wismar engineeering University. Its name is "Optoelectronic Sensor System for Visual Inspection Automats."

And what is special about it?

This inspection automat with camera eyes is capable of examining surfaces and deciding what quality class they belong in. In a single second, about one million pixels are sampled. The information gained from this interrogatioin is fed into the computer which then outputs whether the inspected furniture panel, tile--or it could even be eggs--belongs to the highest or lowest quality class or is pure scrap.

But how long must one wait for an answer?

It all goes much faster than when a human inspector picks up an object and checks and classifies its surface properties, roughness and color. In 3-shift operation, the Wismar eye can free 15 to 18 workers from monotonous labor.

And how expensive is this fellow?

Economists and users say that the unit can pay for itself in 3 months.

Many thanks for the information.

## Integration in Industry Assessed

East Berlin VOLKSARMEE in German No 5, 1984 (signed to press 30 Jan 84) p 11

[Article by Dr Herbert Berteit]

[Text] Today, every industrial employee has access to tools and materials worth over 100,000 marks. It goes without saying that this capital has to be used as effectively as possible if penetrating economic effects are to be achieved. A path to this is the goal-oriented application of robotics. It helps--especially combined with the modernization of machines and equipment--to change the technological processes and, in the end, to structure them more productively.

At the focal point is the creation of continuous manufacturing complexes. Through them, the historical technical limitations on increases in effectivity are overcome and the content of human labor becomes more interesting. In the VEB Kombinat Umformtechnik "Herbert Warnke" Erfurt, process specific robots which enable automatic loading have been built onto existing eccentric presses. This step yielded productivity gains of up to 300 percent, and at the same time freed workers from monotonous and in some cases taxing physical labor.

The type solutions developed by the combine provide the foundations for other factories to modernize their presses.

In the main factory of the VEB Magdeburger Armaturenwerke "Karl Marx"-Armaturenkombinat, on-hand machine tools were modernized and combined with robots within the framework of the combine's own rationalization tool-building program to yield low manpower manufacturing sections which produced a 35-percent increase in productivity. With the aid of two robots, it was possible in the VEB ZEKIWA Zeitz to partially automate a manufacturing section using only the tools and equipment at hand.

In our combines and factories, over 27,000 robots are already at work. As indicated by the examples, they make an important contribution to intensification of production. At the same time, they simplify the work, ease living conditions of the workers and improve the quality of products. Since they become the starting point for uniformly structuring related technologies on modern foundations, it is necessary to modernize machines and facilities; and in the process their lives and effeciencies are thereby increased. Modernization leads in the end to savings in energy, raw materials and materials and eliminates jobs.

## Production Improvements Cited

East Berlin VOLKSARMEE in German No 5, 1984 (signed to press 30 Jan 84) p 11

[Unattributed article]

[Text] A robot in the VEB Fernmeldewerk Bautzen needs just 3.5 minutes to test a circuit board; previously, about 7 hours were required for this process. The robot tests 16 of the most important board types. A particular inspection program

can initiate up to 999 measurement steps and is independently selected by the robot to match to the board presented for inspection. Possible defects in the boards are immediately signaled and can be located and corrected with the aid of a test strategy. Three-shift application of the robots helps save 25,000 labor hours annually in the Fernmeldewerk Bautzen.

Annually, 1.5 million metal tubes for hand vacuum cleaners can be automatically fabricated in the VEB Elektrowaerme Altenburg. For this task, young development engineers designed a robot which transports, swages, trues, and deburrs the parts. The robot is a basic componet of an automatic production line for such tubes.

A mobile industrial robot is employed as part of a low-manpower manufacturing complex in the main factory Karl Marx Stadt of the Werkzeugmaschinenkombinate "Fritz Heckert." The robot moves on a track. Following a prescribed program, it feeds three numerically contollled machine tools. The parts to be machined are transported and loaded into a parts magazine by the robot. Such applications assure high utilization of modern technolgy; this application increases productivity by about 200 percent.

Figure captions

1. This robotic brain with which processes such as machining, sawing, gripping and welding can be controlled was developed by young innovators from Schwerin. It is serially produced in the VEB Landtechnisches Instandsetzungswerk located there.

2. Scientists and engineers in the Zentralinstitut fuer Schweisztechnik Halle continuously strive in their research work to upgrade articulated robots for automated welding processes in the factories of our industry.

3. In the VEB Walzwerk Finow, 4 robots which operate in synchronous pairs take care of stacking into shipping-ready packages rolled steel parts measuring 5 to 12 meters in length and weighing up 100 kg. The process eliminates heavy body-taxing labor; 12 workers were freed to take up other tasks.

4. Protective underbody painting and the application of body primer and finish coating for the Trabant have been accomplished for many years with high precision and more effective use of painting materials by articluated robots in the VEB SACHSENRING Automobilwerke Zwickau.

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# GENERAL ASSESSMENT OF GDR MICROELECTRONICS INDUSTRY, APPLICATIONS

East Berlin PRESSE-INFORMATIONEN in German No 110, 20 Sep 84 pp I-II

/Text/ The economic strategy decided upon by the 10th Party Congress of the SED was oriented towards the systematic utilization of the achievements of the scientific-technical revolution and its ever-closer linkage with the advantages of socialism. According to plan and at a rapid rate, microelectronics is therefore also being developed and is being utilized for a high-performance growth of the national economy. In recent years, extensive capacities have thus been generated to produce microelectronic products.

Just in 1983, for example, new production departments for solid-state switching circuits became operational in the VEB microelectronics "Karl Marx" Erfurt and the Frankfurt/Oder Semiconductor Plant, for integrated switching circuits in the VEB Ceramic Works at Hermsdorf, for special equipment in the VEB Research and Technology Center for Microelectronics in Dresden, and for industrial robots in the Berlin Machine Tool Factory. During the first half year of 1984, further capacities were added, among others for semiconductor chips and semiconductor diodes in the VEB Microelectronics "Karl Liebknecht" in Stahnsdorf as well as for optoelectronic components in the VEB Plant for Television Electronics in Berlin.

## High Growth Rates

On this material basis, and by systematically training and educating the employees, it was possible to achieve a rapid production growth of microelectronic products. For example, between 1978 and 1983 the value of manufactured components in electronics rose from 1.7 billion marks to over 4 billion marks, that is it more than doubled. With integrated circuits and microcomputers, production between 1980 and 1983 increased from 38 million to 59 million or from 3100 to 20,500 units.

The VEB Combine Microelectronics at Erfurt was founded in 1978 and stands as an example of this imposing development. During the first year of its existence it produced active electronic components valued at 575 million marks. During the past year, the volume already amounted to 1.7 billion marks. As regards microprocessors, there were 2,200 units in 1978 and 135,000 units already in

1983. These components are used more than 90 percent in products for data-, computer-, and office-technology as well as control-, regulation-, and automation-technology, but also in modern consumer goods. Microprocessors form the basis for the rapid development of microcomputer technology, which makes possible rapid information processing and the optimal control of processes.

The foundation for what has currently been achieved was laid by the strategic decisions of the Central Committee of the SED and the Ministerial Concil for the Production and Application of Microelectronics of 1976 and 1979. Since that time, only a few years have passed. Today, the GDR belongs among those countries which have available a solid and broad base of their own for microelectronics.

By 1985, in correspondence to the directive concerning the 5-year plan, the production of microelectronic components will double as compared to 1980, in addition to other achievements. The production of highly integrated circuits will triple.

Potentialities of Integration Utilized

From the beginning there was a close cooperation with socialist sister countries as regards the development and constantly widening application of microelectronics. This was especially true as regards the Soviet Union. Already in 1977, the first state agreement concerning microelectronics was concluded between the GDR and the USSR. Points of emphasis here were a work division concerning the development and production of components and switching circuits as well as technological special equipment. As a result of these agreements, for example, a coordinated assortment of modern components was generated, to be used in the minicomputers of both countries. This collaboration was further confirmed by a ministerial agreement in 1981 and the new state agreement on microelectronics of 1982.

Within the framework of the CEMA there exists a general agreement concerning multilateral collaboration in the creation of "a uniform basis for products of electronic engineering, for technological special equipment, and for semiconductor and special materials and their production." Among other things, it provides that the GDR should develop and produce analytical, control, and measurement equipment for the microelectronic industry.

On the basis of disagreement and corresponding other agreements, the GDR currently procures about 20 percent of the components used in the Republic. Its main partners, in addition to the USSR, are especially the CSSR and the Hungarian People's Republic. This collaboration is especially advantageous as regards the available component types. Among the approximately 1100 different types used by us, nearly half come from other countries of the CEMA.

## Major Effects in all Areas

The comprehensive utilization of microelectronics in our country was implemented according to plan, in terms of the conceptions for developing microelectronics itself, the electronic control and computer technology, as well as the use of industrial robots. It starts from the idea that the key technology of microelectronics will combine our national concern for the highest material and energy economy with the required major advances in production automation and in the creation of more efficient products and exports. Its application possibilities include all branches of the national economy, all areas of social life.

But it not only has a revolutionary influence on the material elements of the production process, but simultaneously it is associated with far-reaching changes in the content of the work performed by the employees. Physically strenuous and monotonous activities are reduced, work is enriched with intellectual and creative elements, physical and mental work is increasingly combined.

To combine all these processes according to plan is one of the major advantages of our socialist society, in which technology is used for the benefit of mankind, and where work alienation and existential angst are unknown.

By using microelectronics, about 25 percent material and energy savings on the average as well as considerable production increases can be achieved for the national economy. These advantages appear both in the production of microelectronic products and in their application. For example, the 6881 microprocessor, which weighs only 5.4 grams, replaces 306 kilograms of individual components. The K 1630 computer from the VEB Combine Rototron needs only 20 percent of the power required by conventional computers.

With telex machines, microelectronic components are replacing 900 mechanical parts. As regards a radio device, for example, with a production volume of 1,000 units, there is an annual savings of 5,000 kilograms steel and 1,500 kilograms nonferrous metal. Already now, the quality and efficiency of two-thirds of the entire goods production in the area of the Ministry for Electrical Engineering and Electronics are determined by applications of microelectronics. For example, between 1978 and 1983, the production of machinery and equipment for data processing and office technology rose from 1.9 billion marks to 3.8 billion marks.

In other areas of the national economy, too, microelectronics is highly effective. The use of microcomputer controls in induction furnaces or rolling mills makes possible both an efficient use of power and an optimal utilization of raw materials and other substances. The consumption of process energy can be reduced about 30 percent in major chemical installations by means of microelectronic technology involving measurement, information processing, and control.

The tractor vehicles of local transit systems, for example the Berlin S-train, are equipped with onboard computers and thus provide a more favorable driving pattern which yields up to 15 percent less power consumption. The modern processing centers for machine tool construction and machine processing in our republic are equipped with microelectronic controls. This yields a two-fold to six-fold increase of working productivity. The fraction of final products in which microcomputers, microprocessors, and semiconductor memories are utilized is this year growing here by about 20 percent as compared to 1983. The VEB Combines Textima and Polygraph "Werner Lamberz" as well as the Machine Tool Combine "Fritz Heckert" here make a decisive contribution to this development.

The number of industrial robots used in our economy is growing at a rapid rate. This is a clear example of the broad application of microelectronics. From 13,700 units in 1981 it has increased to more than 35,000 by the end of the first half year of 1984.

Computer-Supported Production-Management

The use of microelectronics is becoming increasingly important for automating production, from computer-aided design to computer-supported control of manufacture. Especially such solutions are highly efficient by means of which computer programs at computer-supported work stations are used by the designers, in the conversational mode with a computer, to design, calculate, and draw the individual parts of a wider and wider spectrum of products. Interconnecting with this, the preconditions are created for computer-supported production administration and manufacture.

Such an efficient solution is designated as cad-cam (computer-aided design - computer-aided manufacture). This was presented, for example, by the VEB Combine for Conversion Technology "Herbert Warnke" at Erfurt, on the occasion of the Leipzig Spring Fair of this year, under the designation Erfurt CAD/CAM. It has proven itself excellently in its original application for computer-aided design, engineering, production control, and the manufacturing of shaping machinery. Developed jointly with research partners in socialist countries, it uses exclusively the device engineering of the GDR and of other CEMA countries.

Erfurt CAD/CAM offers many advantages: high quality and reliability of the products by optimized design of those subassemblies which determine the performance, rapid implementation of user requirements by the use of simulation methods in the planning of subassemblies and parts, as well as high productivity when using the shaping technology through optimal variants for the interaction of machines, industrial robots, and tools.

By means of cad-cam, the production foundations of multi-spindle drilling heads for special machines and cycled lanes were developed, calculated, and automatically produced in the VEB Machine Tool Factory Zella-Mehlis, an enterprise of the Heckert Combine. It was possible to save 14,000 hours of design capacity. The work productivity rose 350 percent for the activities performed by the computer.

This capacity gain in the design and planning as well as the considerably accelerated and very efficient processing of orders corresponds to the requirement to react flexibly to market requirements and to renew the product spectrum at least 30 percent every year.

## The Example of Textima

The results achieved in textile machine construction indicate which paths will especially yield success in the utilization of microelectronics. According to plan, after the VEB Combine Textima was formed, special capacities were created for the utilization of microelectronics. In 1981, the VEB Textima-Electronic in Karl-Marx-Stadt was founded as a center for the design and construction of branch-specific electronic equipment. In this year, such products are available in a value of nearly 40 million marks. The result of this was that, at the present time, more than 40 percent of the textile machines are influenced by microelectronics. Among these belong especially flat knitting automats, rapid spinning systems, domestic sewing machines, and sewing robots. As regards flat knitting automats, for example, work productivity is increased 130 percent through the use of microelectronic client-specific switching circuits. In the case of rapid spinning machines, the number of employees can be reduced by 95 percent as compared to conventional technology. Sewing robots even make it possible to increase productivity five-fold.

The Textima Combine has set itself the task to modernize the existing basis in a goal-oriented manner by utilizing microelectronics and robot technology. With most machines, mechanical subassemblies can be reused with little overhaul expenditure, and important performance increases can be achieved by modern drives and microelectronic controls.

This is also confirmed by an example from the VEB Combine Shaping Technology "Herbert Warnke" in Erfurt. Process-specific robots were added to existing eccentric presses. These made it possible to load the presses automatically and thus to increase productivity considerably. An analysis of the technical state of 1,500 presses indicates that, in virtue of their modernization, work productivity can be raised 100 to 300 percent, and about 1,500 to 3,000 employees can be liberated from physically difficult and monotonous work, and can be used for other tasks. Typical solutions of this modernization process utilize, among others, the combines for roller bearings and standardized parts, household devices, progress in agricultural machinery, and Nagema.

## Youth Engagement

The FDJ (Free German Youth) initiative "microelectronics" was called into life at the 11th Parliament of the FDJ. Its concern is to secure a high-performance rise in the production of microelectronic components and circuits, and further to increase the application area of microelectronics. In 10 regional youth objects "microelectronics" and "industrial robot engineering", about 10,000 FDJ members are active and, beyond this, many thousand youths. They are engaged in all regions and in all areas, in projects involving microelectronics.

The Congress of Working Youth, in the second half of the current 5-year plan, decided to deploy 10,000 industrial robots through youth brigades and in youth objects. This also underscores that the young generation is making an effective economic contribution to reinforce our republic through the solution of demanding scientific-technical tasks.

Microelectronics and Consumer Goods

Relationships between microelectronics and consumer goods exist from a double perspective. On the one hand, the increasing availability of microelectronic-equipped machinery and systems is an important presupposition for increasing the production of consumer goods. Modern machine tools, such as are used e.g. in the production of drilling machines, or computer-controlled chemical installations for plastic production, make a direct contribution towards increasing the supply of consumer goods. On the other hand, microelectronics is used to improve the use properties of products pertaining to popular needs or to offer products with new characteristics. Thus, highly integrated switching circuits in the area of radio and television, for example, contribute to considerably higher use characteristics. At the same time, the weight-performance ratio is becoming more favorable and energy consumption is also being reduced.

With household sewing machines or automatic washing machines, microprocessors also expand to the use possibilities. The like holds for refrigerators and cameras. There are some consumer goods that could not exist at all without microelectronics, for example calculators, quartz watches, electronic video games, and home computers. Expanding this palette is part of the effort towards the ever-wider application of microelectronics in all areas.

8348
CSO:2302/7

## EDP COMPUTER TAPES DESCRIBED

East Berlin DDR EXPORT (GDR EXPORT) in German No 14, 1984 pp 12-14

[Article: "ORWO Computer Tape: A Reliable Storage Medium for Data processing"]

[Text] New knowledge and developments are causing intensification of information relations in all fields of science, the economy and social life. Electronic data processing has become worldwide a requirement of our time. ORWO computer tapes are a highly reliable partner for information storage, processing and transfer.

The Dessau Magnetic Tape Plant VEB, a combine enterprise of the Wolfen Photochemical Combine VBEB, produces a line of digital recording and storage media: ORWO computer tapes, types 415, 425 and 430, and a digital cartridge, type 490. The tape base is polyester film (PETP). It meets the nearly extreme requirements placed on data tapes regarding resistance to severe permanent and likewise intermittent mechanical loads.

The tape base is covered with a magnetizable coating of high-grade polymers, embedded in a suitable binder which also has very high resistance. The requirement for high reliability of data reproduction by a coating subject to high mechanical loads is, in addition to raising storage density, one of the main directions in the development and production of modern computer tapes.

Some general relations playing a role in raising computer tape recording densities are explained in the following. As the linear recording density increases, the recording wavelength, the average flux change interval and the storage area available for a flux change on the magnetic tape, at a constant track width, decline as follows:

| Type | 415 | 425 | 430 |
|---|---|---|---|
| Flux change/millimeter, Fw/mm | 32 | 126 | 356 |
| Density | 800 bpi | 1600 bpi | 6250 bpi |
| Wavelength, micrometers | 62.50 | 15.87 | 5.62 |
| Average flux change interval, micrometers | 31.25 | 7.94 | 2.81 |
| Storage area/flux change, $mm^2$ | $3.41 \cdot 10^{-2}$ | $8.65 \cdot 10^{-3}$ | $3.06 \cdot 10^{-3}$ |

This means e.g. for type 415: With a storage density of 32 Fw/mm or 800 bpi, each bit of alternately magnetizable areas is stored on an area of 0.03 mm x 1.1 mm, thus on less than 0.033 $mm^2$ on the tape. These are very high requirements on the magnetically active coating since noise of less than 0.03 $mm^2$ can already cause drop outs. The storage area per flux change available for data storage at a density of 356 Fw/mm per is reduced for that reason again by the factor of 10.

With the introduction of ORWO computer tape type 425 (density = 126 Fw/mm or 1600 bpi) and type 430 (density = 356 Fw/mm or 6250 bpi) according to the GCR technique (group coding method), the Dessau Magnetic Tape Plant VEB joins the leading producers of modern computer tapes.

Special requirements for ORWO computer tape type 430 stem from this tape having to support multivalent use for a low (32 Fw/mm), a medium (126 Fw/mm) and a relatively high density (356 Fw/mm). This means, in addition to the specific conditions for high density, the Dessau Magnetic Tape Plant VEB naturally also ensures the compatibility of conditions for lower densities determined in the international standards.

As the density is increased however, the effective magnetizable coating thickness is reduced as follows:

| Fw/mm | 32 | 126 | 356 |
|---|---|---|---|
| micrometers | 5.0 | 2.4 | 0.9 |

Based on the small effective magnetizable film thickness at 356 Fw/mm, it is evident that the uniformity and surface quality of the magnetizable film has a significant effect on the record/playback characteristics of the data medium at this high density. This uniformity and related reproduction reliability are also guaranteed in addition from a longer service life .

To determine reproduction reliability under continuous operation, a section of tape one to two meters long is used for one-time recording of continuous flux changes and this tape is continuously passed over a magnetic head in the reverse direction. Through the use of binding systems resistant to high mechanical loads in the composition of the magnetizable film, the Dessau Magnetic Tape Plant VEB guarantees the correct reproduction of the information recorded one time even after 100,000 head passes for ORWO computer tape types 415 and 425 and after 120,000 head passes for type 430. The high retention of these tape types is due to the low drop in the average reproduction voltage amplitude found in the process.

The high mechnical resistance of the magnetically active film of types 415, 425 and 430 to wear and film destruction is due e.g. to their input unit, their resistance to tearing, to the firm adhesion of the film to the base and their immunity to climate. The explicit value of just one parameter can however not explain the behavior of a computer tape in use. In this respect, the unit always formed by the magnetic tape and drive shouls also be considered. Serious differences in the device design, maintenance and adjustment can noticeably affect tape wear.

High performance, operating security and long service life determine the cost-effectiveness of ORWO computer tapes.

ORWO Computer and Video Tapes

ORWO Computer Tape

| Type | Base | Density Fw/mm | Density bpi | Characteristics | Manufactured Length (m) | Kind |
|---|---|---|---|---|---|---|
| 415 | PETP | 32 | 800 | stretched polyethylene terephthalate film and magnetizable film of ferromagnetic pigment, homogeneously distributed in wear-resistant and flexible binder | 366/732 | tape seal or plastic canister |
| 425 | PETP | 126 | 1,600 | same as type 415 | 366/732 | " |
| 430 | PETP | 356 | 6,250 | same as types 415/425 | 366/732 | " |

ORWO Digital Cartridge

| Type | Base | Density Fw/mm | Density bpi | Characteristics | Kind |
|---|---|---|---|---|---|
| 490 | PETP | 32 | 800 | The cartridge is used for magnetic storage of digital signals and digital data exchange on digital cartridge drives; there is also the ORWO KR digital cleaning cartridge. | international compatible two-hole cartridge |

ORWO Video Tapes

| Type | Base | Tape Width (mm) | Thick-ness (microns) | Characteristics | Manufactured Length (m) | Kind |
|---|---|---|---|---|---|---|
| 640 | PETP | 12.7 | 27 | stretched polyethylene terephthalate film and magnetizable film of chromium dioxide pigment; for semi-professional use, but only on video reel recorders. | 280/360/450 | Reel NG 13 or NG 15; pivot box or plastic container |
| 641 | PETP | 12.7 | 20 | similar to type 640, but conforming to the slant track recording method for VCR system cassettes | 280/400 | Reel NG 13 (length 280 mm) and reel NG 13 or NG 15; pivot box; meter |
| | | | | | 1,050/1,300/ 1,560 | ware on precision reel according to ISO 1864 |
| 660 | PETP | 25.4 | 27 | studio tape with chromium dioxide magnetizable film for professional applications, mainly on 1" studio machines according to the B standard | 690/950/ 1,400 | 1" metal reel with NARTB core; packing in carry container |

Fw = flux changes/mm; bpi = bits/inch; 12.7-mm width = 1/2" tape; 25.4-mm width = 1" tape.

Technical Data

| Physical values: | ORWO digital cartridge type 490 | ORWO computer tape type 415/425/430 |
|---|---|---|
| base | PETP | PETP |
| leader tape: | | |
| length (total) | $800^{+300}_{-100}$ mm | |
| thickness | 0.036 mm | |
| transparency | clear | |
| magnetic tape: | | |
| length | $86^{+4}_{-0}$ m | 732/366 m |
| width | $3.81^{+0}_{-0.05}$ mm | $12.7^{+0}_{-0.1}$ mm |
| thickness | 0.017 ± 0.002 mm | 0.048 ± 0.008 mm |
| thickness of magnetic coating | 0.005 ± 0.001 mm | < or = 0.015 mm |
| overall stretching | 0.08 ... 0.5% | < or = 1% |
| surface area resistance | < or = $10^9$ | $5 \cdot 10^5 \ldots 5 \cdot 10^8$ |
| splices | none | none |

Electrical values

| | | |
|---|---|---|
| tolerance of average reading voltage amplitude | +25/-10% | < or = ±10% (type 415)<br>< or = +25/-10% (type 425)<br>< or = ±40% (type 430) |
| erasability | < or = 3% | < or = 4% |
| special properties | --in computer tape quality<br>--high storage capacity<br>--high mechanical reliability<br>--meets ECMA and ISO standards<br>--easy to handle | --high reliability over 100,000 or 120,000 head passes<br>--extremely low head abrasivity |

8545
CSO: 8120/0120

ROBOTS DISPLAYED, OMITTED AT BUDAPEST INTERNATIONAL FAIR

Budapest SZAMITASTECNIKA in Hungarian Jul 84 p 11

[Article by Dr Jozsef Marton: "Robot Technology"]

[Text] The information system developed jointly by Hungexpo and Datorg knows of only four firms which displayed robots or manipulators at the 1984 Budapest International Fair and not one of them is a Hungarian enterprise or an enterprise in another socialist country. Although the actual situation deviates a bit from what is recorded in the database it does not do so to such an extent that the deviation between the well known timeliness and significance of robot technology and the role played by it at the Budapest International Fair should not be striking. We attempt an explanation of this in what follows.

The most industrial robots could be found in the pavilion of the machine tool industry exhibit. The Machine Tool Factory of the Csepel Works and the Machine Tool Industry Works each displayed one lathe with a robot work piece exchanger. In the former one could see a robot manufactured in Bulgaria on the basis of a license from the American VERSATRAN-PRAB and in the latter case one manufactured in Bulgaria on the basis of a license from the Japanese FANUC. Bulgaria also exhibited the latter model (IR 241) separately, together with the IR 242, a member of the same family which can be attached directly to the machine tool. In the same place the GDR exhibited its hydraulically driven work piece exchanging robot (IR 2S1), already used extensively within its domestic industry. Why these robots are missing from the information list can be explained, among other things, by the fact that today a work piece exchanging robot is as much a part of modern machine tools as a tool exchanger, so it is not advertised separately.

Of the two exhibited painting robots one is well known in Hungary: six of the robots manufactured by DeVilbiss-Trallfa already work in the country--successfully. The one displayed here, and already purchased as the seventh, is the TR-4000 model, a version which is further developed in many respects, and its new microprocessor control merits special attention. This facilitates path transformations and conveyor tracking and--after appropriate software development--analytic programming. The interesting feature of Dr Tettenborn GmbH painting robot is that it uses for painting a direct current, servo driven robot, already known from an earlier Budapest International Fair, which is

made by Junghenrich and sold by the Closs firm as a welding robot. This adaptation presumes substantial changes, compared to the original solution, in both the method of teaching and the safety technology solutions.

The extension in the application of robot technology methods is illustrated by the RoBoTec equipment of the Swiss Castolin firm, developed for welding and metal application procedures, and the equipment family of the West German DYNA/PERT firm for assembling printed circuit cards. These--although in their outward form they hardly resemble the conventional robot arms--have within a given technology, in addition to high productivity, a flexibility, reprogrammability and manipulation capability at the same level as that of robots. Especially the latter, electronics assembly technology is the area where one can well observe the process of the specialization of robots and the "robotization" of mass manufactured special purpose equipment.

The absence of the robot manufacturers of the socialist countries and of other countries specializing for the socialist market is explained in part by the market difficulties (a relative shortage of goods, the embargo) and in part by specialized exhibits held in the recent past (Robotu '84 in Brno and the metal working exhibit in Moscow). The reason for the absence of the Hungarian robot manufacturers is much simpler. Professional public opinion has been acquainted for several years with the successfully manufactured simple pneumatic packing robots: and the further robot developments now under way have not yet reached a stage where they could be exhibited. We could find one exception to this at the exhibit of the Bakony Works. Here, in addition to the simple packing robots integrated into an imposing automatic assembly system, we could find an intelligent classifying device which contains a form recognition module developed within the framework of robot research taking place at MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences], adapted to the jigging feeders of the Bakony Works, to carry out assembly technology classification and sorting tasks which cannot be carried out by traditional methods. Depending on the type of jigging feeder, or rather on the type of vibrating bar, the device can be used to separate or sort rod or sheet type parts. The device, using an industrial television camera, identifies the work pieces moving constantly in its field of view and determines their position. Thus the device can be used to feed sorted work pieces to automatic assembly machines.

A separate exhibit of the SZTAKI displayed other industrial applications possibilities of the VM-02 form recognition module.

8984
CSO: 2502/6

## POLAR RESEARCH IN EARTH SCIENCES DESCRIBED

Warsaw NAUKA POLSKA in Polish No 3, May-Jun 84 pp 33-46

[Article by Krzysztof Birkenmajer, associate member of the Polish Academy of Sciences: "Earth Sciences in Polish Polar Research (The 50th Anniversary of Polish Polar Research, 1932-1982)"*]

[Text] Introduction

Research expeditions by Polish explorers in the Arctic and Antarctic regions have already a 50-year history. It began with the expedition to Bear Island in the Arctic Svalbard Archipelago in 1932-33, which was organized in conjunction with the international research project known as the Second Polar Year.

Exploration activities and discoveries made by Poles in the polar regions, however, started long before the attainment of independence in 1918. In the Arctic regions of Siberia, Jaczewski, Piwowar, Wollosowicz, Ciaglinski, Bohdanowicz, Dybowski and especially Czekanowski and Czerski have made geographic and scientific discoveries which have perpetuated their names in the history of exploration of that part of the Eurasian continent. In the Arctic, Arctowski and Dobrowolski, who were participants in the Belgian scientific expedition of 1897-99, pioneered meteorologic, glaciologic, and geologic studies.

Polish polar expeditions organized after our nation gained independence continued those traditions. Many of the participants of these expeditions came from university circles associated with A.B. Dobrowolski (Warsaw center) and H. Arctowski (Lwow center); these personalities had a major influence on the directions of projects and their own experiences in polar exploration were helpful in their implementation.

*Paper read at the Festival Session dedicated to the 50th anniversary of Polish polar research (1932-82) in the Royal Palace, Warsaw, on November 8, 1982.

Polish Arctic expeditions can naturally be subdivided into projects undertaken between the First and Second World Wars (1932-38) and those of the postwar period from 1956 to the present time.

Expeditions of 1932-38

The first period of exploration from 1932 to 1938 was marked by dynamic development of Polish polar research in the Arctic region. Five exploratory and scientific expeditions were organized at that time: four to the Svalbard Archipelago (Bear Island and Spitsbergen) and one to western Greenland.

1. Expedition to Bear Island (Bjørnøya) was organized under the auspices of the Second Polar Year upon the initiative of J. Lugeon, the director of the State Meteorological Institute in Warsaw. The expedition worked on the island for 13 months (1932-33), performing meteorological studies and geophysical research (geomagnetism, aurora borealis, solar radiation and radiomagnetic storms). The expedition consisted of five members, three of whom stayed on the island throughout the winter (C. Centkiewicz was the head of the expedition).

2. The expedition to Torell-Land on the Spitsbergen in 1934, organized by the Tatrzanski Mountaineers' Club, comprised seven members (head S. Bernadzikiewicz). For two months during the polar summer the expedition conducted triangulation and photogrammetric measurements, and geologic, botanical and ornithologic studies in this, at that time virtually unknown, land.

3. A three-person expedition to the Spitsbergen in 1936 pursued both exploratory and sports objectives. For one and a half months, its participants covered a route of over 800 km along the island from the south to the north. They walked mainly on skis, pulling their equipment on Nansen sleds. The expedition pursued no special scientific purpose.

4. The expedition to western Greenland (head A. Kosiba) consisted of seven participants. It worked for three months of the polar summer near the Arfersiorfik fiord, conducting photogrametric studies, meteorological observation, glaciologic, geomorphologic, geologic and botanical research.

5. A four-person expedition to Oscar II Land, northwestern Spitsbergen, in 1938 (head S. Bernadzikieicz) conducted for two months of the polar summer geomorphologic and glaciologic studies, as well as meteorologic observations. They also compiled a botanical collection.

Expeditions Since 1956 to the Present Time

The second period, from 1956 to the present, was marked by further intensive development of Polish polar studies in the Arctic region, especially on the Svalbard Archipelago and also in Greeland, Jan Mayen and in the subarctic zone of Iceland.

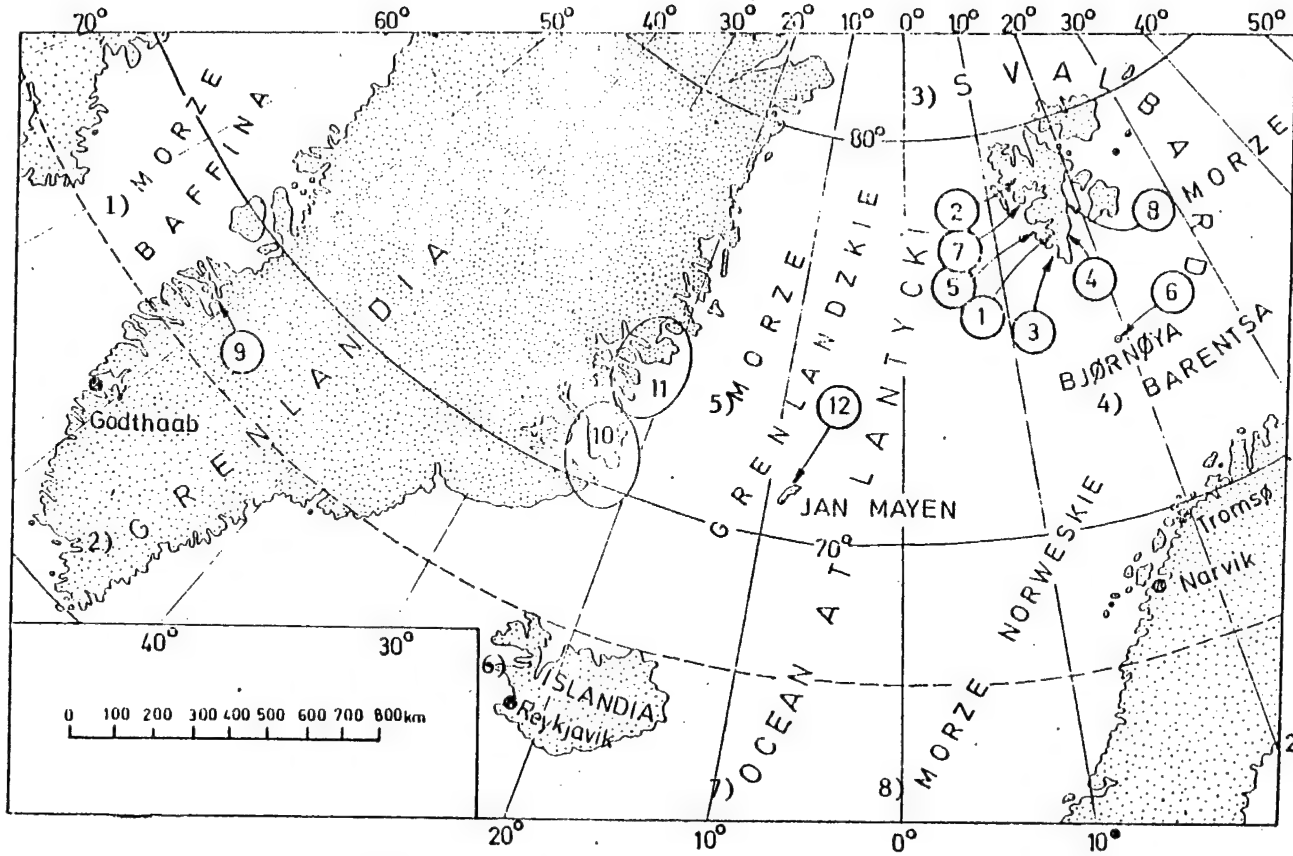


Figure 1. Areas of Polish Polar Explorations in the Atlantic Part of the Arctic Region. 1 - Torell Land, Northwest; 2 - Oscar II Land; 3 - Hornsund; 4 - Torell Land, East; 5 - Bellsund; 6 - Bear Island (Bjørnøya); 7 - Isfjorden; 8 - Agardbukta; 9 - Arfersiorfik; 10 - Scoresby Land and Jameson Land; 11 - Kong Oscar Fjord - Clavering Ö; 12 - Jan Mayen.

Key:
1 - Baffin Bay
2 - Greenland
3 - Svalbard
4 - Barents Sea
5 - Greenland Sea
6 - Iceland
7 - Atlantic Ocean
8 - Norwegian Sea

1. Polish Polar research after World War II was renewed under the direction of S. Siedlecki in conjunction with the Third International Geophysical Year (IGY) in 1957-58. This work was continued within the framework of the International Geophysical Project (IGP) in 1959-60, encompassing six seasons of work: 1956 (reconnaissance), 1957-60 (mainly summer expeditions and one winter stay in 1957-58) and 1962 (supplementary winter expedition). The principal terrain of study was the southern Spitsbergen from Van Keulenfjorden in the north to Sørkapp in the south, around the Polish Research Station of the Polish Academy of Sciences [PAN] in the White Bear Bay (Isbjørnhamna) built in 1957. From 25 to 36 individuals participated in each of the summer expeditions from 1957 to 1960. The group that stayed for the winter consisted of 10 people. For the first time, Polish transport and research ships took part in polar exploration.

The Spitsbergen expeditions of III IGY-IGP project conducted scientific studies in a broad range from geophysical disciplines, such as meterology, geomagnetism, studies of the aurora borealis, ionosphere, ozone content in the atmosphere and radioactivity of precipitation, to geodetic research and astronomic observations, to studies in limnology and oceanography, botany and zoology, to glaciology, geomorphology and geology, including paleontology. Studies of glacial and periglacial geomorphology and the geology of the Quaternary and pre-Quaternary periods (pre-Cambrian--Cretaceous) were particularly broad. The latter studies were linked with the results obtained by the expedition to Torell Land in 1934.

Spitsbergen research of III IGY established the importance of Polish studies in polar research. One evidence of this importance was placing participants of these expeditions in charge of the jointly organized research expeditions to the Spitsbergen by the International Geological Congress and International Geographical Congress in 1960.

2. Wroclaw expeditions to the Spitsbergen, 1970-75. After a long interruption, expeditions to the Spitsbergen were renewed in 1970 under the general direction of S. Baranowski on the initiative of the Commission for Geophysics created in the framework of the National Committee for Geodesy and Geophysics of the PAN. These expeditions were done by the Geographical Institute of Wroclaw University (1970-74), with the cooperation of the Institute of Geophysics of the PAN. The latest (sixth) expedition (1975) was organized jointly by the Institute of Geophysics of the PAN and the Paleozoology Center of the PAN.

The scope of the exploration of land groups in 1970-74 comprised glaciology, ice seismology, glacial and periglacial geomorphology, paleontology and geology, as well as zoology and botany. Oceanographic studies were conducted on a limited scale in the area of Hornsund Fjord. In 1975, the program of the expedition included studies in geophysics, paleontology, geomorphology, oceanography, climatology, soil science and ornithology.

3. Central group of research on the Spitsbergen after 1978. From 1978, the scientific research station of the PAN in Polar Bear Bay (Isbjørnhamna) on

the Spitsbergen, which has been modernized to meet new research objectives, has again become the center of Polish scientific activity year-round. A large range of studies is conducted here in conjunction with the IGY-IGP program (1957-60), the expedition of the Wroclaw group (1970-75) and under the interministerial plan MR.II.16 (1978-80) and MR.I.29 (after 1981). The expeditions are organized by the Institute of Geophysics of the PAN. At the same time, the S. Baranowski Glaciological Station (at the head of the Werenskiold Glacier) is active in this region. It is run by the Geographical Institute of Wroclaw University.

4. Paleontological expeditions on the Spitsbergen, 1974-1979. These expeditions were organized by the Paleozoology Institute (currently Paleobiology Institute) of PAN, under direction of G. Biernat, in 1974 and 1975. They worked near Hornsund (as part of Wroclaw group project), and, in 1976 and 1979, also near Bellsund and Isfjord, in central Spitsbergen. The objectives of these expeditions included investigation of fossil fauna, primarily the fauna of the Upper Paleozoic and the Mesozoic. The studies were also concerned with the problems of paleoecology and related issues. The expeditions compiled extensive collections of fossil invertebrate animals, currently studied in Poland.

5. Paleontological expeditions on the Spitsbergen, to Oscar II Land. These expeditions were undertaken in 1975 by the Geographical Institute of the M. Kopernik University and the Center for Geomorphology and Hydrography of the Institute of Geography and Territorial Management of the PAN in Torun under the overall direction of J. Szupryczynski and G. Wojcik, as a continuation of studies begun by a Polish expedition in 1938. Six expeditions have already been organized (in 1975, 1977, 1978, 1979, 1980 and 1982). The expeditions use as a base their own permanent building erected on Kaffiøyra in 1975. These expeditions are conducting glaciologic, climatologic, hydrologic and geomorphologic studies and, to a lesser degree, also geologic and other investigations.

6. Polish-American Geophysical Land Expeditions on the Spitsbergen in 1974-79 (principal investigators K. Birkenmajer and M. Jelenska). These expeditions were made under a joint research project of the Institute of Geophysics of the PAN and the University of St. Louis (United States), concerned with paleomagnetism of Spitsbergen rocks and seismology: in 1974 studies were done in the area of Hornsund, in 1977 near Agardhbukta Bay in eastern Spitsbergen and in 1979 near Isfjorden in central Spitsbergen.

7. International geophysical marine expeditions on the Spitsbergen and Greenland Sea based on "Kopernik" r/v were conducted in 1976 and 1978 (head A. Guterch) under a joint research program of the Institute of Geophysics of the PAN (with participation of marine and land geophysics enterprises in Torun) and the Universities of St. Louis (United States), Bergen (Norway) and Hamburg (FRG). The expeditions conducted deep seismic sounding of the earth's crust on the latitudinal and longitudinal geotraverses in the shelf zone off the western shore of the Spitsbergen.

8. Gdansk and Szczecin oceanographic expeditions on the Spitsbergen. The Institute of Oceanography and the Student Oceanographic Circle of Gdansk University jointly with the Higher Marine School in Gdynia organized four expeditions (1977, 1979, 1980 and 1981) to southern Spitsbergen, mainly to Hornsund, to conduct oceanographic research and studies of marine biology.

In the area of Bellsund Fjord in central Spitsbergen, in 1977, an oceanographic educational expedition was operated by the Higher Marine School and the Agricultural Academy in Szczecin.

9. Silesian expeditions on the Spitsbergen. Since 1978, the Geographical Institute of the Silesian University at Sosnowiec (principal investigator M. Pulina) and the Geographical Institute of Wroclaw University (principal investigators A. Jahn and J. Pereyma) have been sending almost every year an expedition to the Hornsund area for studies in glaciology (mainly on the basis of the S. Baranowski Glaciological Station), as well as in geomorphology and hydrology, with special focus on the polar karst phenomena (in rock and ice sheets).

10. Warsaw expeditions on the Spitsbergen. In 1978 and 1980, expeditions of geography students from Warsaw University worked on Nordenskiold Land and at the mouth of Istfjord, implementing a geomorphology research program which involved topographic surveys.

11. Krakow expeditions on the Spitsbergen. Since 1980, four summer expeditions (1980, 1981, 1982 and 1983) have been organized to the Sørkapp Land by the Geographical Institute of the Jagiellonian University (head Z. Czeppi). The expeditions conduct a program of physiographic studies, including research in geomorphology, geology, and limnology, as well as botany, zoology and archaeology.

In 1983, independent geologic exploration in the area north of Hornsund was conducted by a group of scientists and students from the Institute of Geology and Mineral Resources of the Academy of Mining and Metallurgy. That group mainly investigated pre-Cambrian rocks and took samples of glacial ice for study of mineral and radioactive impurities.

12. One should also note the summer geodesic expedition organized by the Polish Geodetic Society (head C. Lipert) which worked near Hornsund on the Spitsbergen (1982). The Institute of Geophysics of the PAN held marine geophysical expeditions (directed by S.M. Zalewski) working in the area of Bear Island and Southern Spitsbergen, which prepared seismoacoustic profiles of sea floor sediments (1982 and 1983).

13. Greenland. Geological studies in Eastern Greenland, as part of a project conducted by Danish explorers in 1971 and 1976, were done by K. Birkenmajer. In Western Greenland in 1973 a scientific-educational expedition of students of Wroclaw University worked in the area of Nordre Isortoq (geomorphology and periglacial studies).

14. Jan Mayen. In 1970, K. Birkenmajer conducted brief volcanological investigations on Jan Mayen Island in the Northern Atlantic after eruption of the Beerenberg Volcano, which had been inactive for centuries.

15. Iceland. Scientific expeditions on Iceland, which lies in the subpolar zone, were organized in 1968 by the Polish Geographical Society (head R. Galon) and in 1972 by the Geographical Institute of Lodz University (head S. Jewtuchowicz) and also by the Sailors' Academic Club. Scientific explorations were mainly concerned with the marginal zone of the ice sheets. In 1975, a five-member group from the Higher Marine School at Szczecin conducted glaciologic studies and mountaineering. In 1981, Wroclaw University and the Polish Society of Friends of Earth Sciences organized a geological, scientific and educational expedition into volcanic areas of western and central Iceland.

16. We should also mention that, in the northern polar zone of the American continent (Arctic Canada and Alaska), Polish participants S. Baranowski, A. Jahn and L. Dutkiewicz worked within the framework of U.S. and Canadian expeditions (glaciology, geomorphology and periglacial processes).

Earth Sciences in Antarctic Expeditions

1. Eastern Antarctica. The first Polish Antarctic expedition that pursued reconnaissance goals took place during the Antarctic summer season of 1958-59 (seven persons, expedition head W. Krzeminski). This expedition used Soviet transport ships and took over from USSR the Oazis Station in Eastern Antarctica (the Knox Coast) in January of 1959, which was renamed the Dobrowolski Station (S.Z. Rozycki on behalf of the PAN). The expedition implemented a limited exploration program in gravimetry and also Quaternary geomorphology and geology.

Regrettably, despite this good beginning, government subsidies for further research were discontinued and the Dobrowolski Station interrupted its work until the Antarctic summer season of 1978-79. At that time, the Institute of Geophysics of the PAN organized the second expedition (14 members, head W. Krzeminski) which conducted studies in meteorology, climatology and glaciology, as well as the geomorphology and geology of the Quaternary. These were compiled by astronomical, gravimetric, magnetic, geodetic and photogrametric measurements.

2. The Western Antarctic Region. Since 1977, the Polish H. Arctowski Station, built by members of the expedition of the Institute of Ecology of the PAN (director S. Rakusa-Suszczewski), has been working on the King George Island. This station operates year-round, mainly concerned with comprehensive biological studies and in particular the connections between land and marine ecosystems, as well as earth science studies with stationary meteorologic, seismologic and magnetic registrations. The station also conducts satellite observations for meteorologic and ice forecasts and also limnologic, oceanographic, geologic, paleontologic, geophysical prospecting and other work. A series of expeditions that have

already covered the entire territory of King George Island, Nelson Island, Penguin Island and their surroundings are organized by the Institute of Ecology of the PAN. Studies make up part of the interministerial research programs MR.II.16 (1976-80) and MR.I.29 (from 1981).

3. The Western Antarctic marine geophysical expedition organized by the Institute of Geophysics of the PAN (with the cooperation of Enterprises of Marine and Land Geophysics in Torun and the Hydrographic Service of the Navy) on "Kopernik" r/v worked in the Antarctic summer season of 1979-80 (director A. Guterch) in the area of Southern Shetland Islands (from Drake's Passage to the Antarctic Peninsula) and further west up to the Bellingshausen Sea. The scope of research included deep seismic sounding to study the structure of the continental and oceanic earth's crust in this area and also shallow seismic soundings for description of the structure of the seafloor.

Major Directions and Accomplishments of Research in the Earth Sciences

1. Meteorology and climatology. Meteorologic and climatologic studies were mainly conducted on research stations Hornsund (Spitsbergen) and Arctowski (Western Antarctic region) throughout the year and also by expeditions during the polar summer for synoptic purposes and weather forecasts, and also as a component of glaciologic, periglacial and ecologic exploration. These studies are conducted according to the guidelines of the WMO, and the program and observation frequency are planned to meet these standards. These observations are expanded (at the Arctowski Station) by satellite photography for weather forecasts and ice movement forecasts which are used by Polish fishing boats operating in the Western Antarctic region and the Scotia Sea.

2. Geomagnetism. Studies of the earth's magnetism were conducted in 1957 and 1958 near Hornsund Fjord on the Spitsbergen (measurements of magnetic declination and inclination to register the secular variation of earth's magnetism). Automatic recording of variations of earth's magnetism were performed throughout the year at Arctowski Station (Western Antarctic region) since 1977-78, as well as at Hornsund Station (Spitsbergen) since 1978.

3. Aurora australis and night glow. These studies were conducted in the winter of 1957-58 at Hornsund Station; however, the position of this station is not favorable for this purpose because the scope of the horizon is confined by high mountains.

4. Studies of the ionosphere and propagation of radio waves were done in the winter of 1957-58 at the Hornsund Station. The position of the station amid high mountains, however, resulted in suppression and reflection of waves, and these studies were therefore discontinued.

5. Radioactivity of the air and atmospheric precipitation was studied at the Hornsund Station in 1957-58 and also at the Molodezhnaya Station in the Antarctic in 1966 (Polish scientists took part in the Soviet expedi-

tion). This research contributed to evaluation of the degree of contamination of the atmosphere by products of nuclear explosions and their circulation in the atmosphere.

6. The chemistry of the atmosphere and its contamination. At the Hornsund Station in 1957-58 the ozone and $CO_2$ contents in the near-surface zone were measured. The study of industrial contamination (especially toxic concentrations of $^{226}Ra$ and its derivative $^{210}Pb$) in solid precipitation (snow and ice sheet masses) and on ice sheet sections encompassing several decades was done with the materials collected on the Spitsbergen in Hornsund Fjord (1974) and in the Admiralty Bay on King George Island in the Antarctic region (1979).

7. Seismic explorations. Registration of earthquakes is conducted at the Arctowski Station (since 1977) and at the Hornsund Station (since 1978). Microshocks on Spitsbergen glaciers (in 1971 and 1974) were also studied here. The objective was to establish the relationship between occurrence of quakes and their localization, energy and movement of the glacier, and, in a more general sense, to observe ice sheets as a simple model of elastic bodies.

8. Gravimetry. Gravimetric (oscillational) measurements were conducted at the Dobrowolski Station in the Eastern Antarctic (1958-59; 1979-80).

9. Comprehensive geophysical programs. Studies in this area included: (a) paleomagnetism, (b) deep seismic sounding, (c) shallow seismic sounding, (d) seismoacoustic profiles, (e) geoelectric profiles and (f) profiling with proton magnetometers.

a. Paleomagnetic studies of Paleozoic and Mesozoic sedimentary rocks and volcanic intrusions of the Lower Cretaceous were done on materials collected on the Spitsbergen by three expeditions (1974, 1977 and 1979). Samples of Cretaceous and Tertiary lavas were also collected on King Geroge Island in Western Antarctica (1978-79; 1980-81). These studies made it possible to reconstruct the position of ancient Cretaceous flows (based on Spitsbergen data), which is important for outlining the routes of continental drift.

b. Deep seismic sounding (groups directed by A. Guterch) were conducted by marine exploration expeditions in the area of the Spitsbergen (1976, 1978) and in the Western Antarctic region (1979-80). These studies yielded valuable original data that allowed constructing a model of contineta1 crust and the adjacent oceanic zone in passive belts (Spitsbergen) and active belts (Western Antarctica) of the lithosphere.

c. Shallow seismic sounding and d. seismoacoustic profiling were conducted as part of the Antarctic expedition of the "Kopernik" r/v (1979-80) and also in the area of the Bear Island and Southern Spitsbergen (1982 and 1983). They yielded valuable data for analysis of shallow geological structures and the type of sediments on Recent seafloor.

e. Geoelectric profiling and f. proton magnetometry were done on the Spitsbergen and King Geroge Island (Western Antarctic region) to evaluate the thickness of the ice sheet and the course of dislocation zones.

10. Geodesy and cartography. Preparing maps for research by Polish polar expeditions is a constant element of work since 1934. One should mention here photogrammetric surveys made for the map of the scale 1:50,000 by A. Rogala-Zawadzki based on triangulation of S. Zagrajski in the northwestern part of Torell Land on the Spitsbergen (1934) and in the area of Arfersiorfik Fjord in Western Greenland (1937), and subsequent work (in 1957, 1958 and 1959) performed by groups directed by C. Liperta on Werenskiold, Penck and Hornsund Glaciers on the Spitsbergen with a high degree of detail--1:5000 and 1:2000. New detailed maps of glaciers were compiled subsequently on the Spitsbergen and surveys of entire regions were made, including Admiralty Bay system on King George Island (1978-79) and the Bunger Oasis near Dobrowolski Station (1978-79) for 1:50,000 and more detailed maps were made with the assistance of helicopter surveys.

11. Geographic longitude and latitude. Using astronomic techniques, the geographic longitude and latitude of Hornsund Station (in 1957-58), Arctowski Station (1977-78) and Dobrowolski Station (1978-79) were determined.

12. Hydrology. Hydrologic (limnologic) investigations were performed in the area of Hornsund Station since 1958, mainly in connection with glaciologic studies. In the past few years, this research was expanded to encompass the karst phenomena of the polar climate--the true karst phenomena (in Carboniferous rocks) and ice karst phenomena (studied by groups of M. Pulina). Hydrologic research on the Spitsbergen has been included in a comprehensive project of ecologic studies. In the area of Arctowski Station, hydrologic research makes up part of the studies of the interaction of sea and land ecologies.

13. Oceanography. Oceanographic research was begun in 1957-58 on the Gdynia-Spitsbergen routes and since then was conducted with interruptions on a limited area in the region of Hornsund Fjord (Spitsbergen). These studies were intensified after 1977, but are still fragmentary and sporadic because they are done by separate regional groups and not organized under a common exploration plan.

In the area of the Admiralty Bay and especially Ezcurr Fjord on the King George Island (Western Antarctic), extensive oceanographic exploration concerned with the chemical and physical parameters of seawater, sea currents, ice, seafloor configuration, etc., since 1977 were done as part of studies in marine ecology. These studies are not limited to the Arctowski Station but encompass (in the framework of Biomass Project--1980-81, 1983-84) the entire Bransfield Strait, a large part of the Drake Passage and a portion of the Scotia Sea.

14. Glaciology. Glaciologic studies were an important project on the Spitsbergen in 1957-60 (expedition director A. Kosiba), in 1962 and 1970-75

(director S. Baranowski) and also since 1978 to the present time. They were mainly conducted on the Werenskiold Glacier and also (to a lesser degree) in the central area of the Wedel Jarlsberg Land (Amundsenisen) and on the southern coast of Van Keulenfjorden. In Oscar II Land (Polish expedition, since 1977), an extensive program of glaciologic study has been conducted as a continuation of the early work in 1938.

Glaciologic studies in Western Greenland were included in the work of the 1937 expedition.

Contemporary glaciologic studies were performed in the surroundings of the Arctowski Station (1978-79) and the Dobrowolski Station (1978-79) in the Antarctic region.

The S. Baranowski Glaciologic Station at the head of the Werenskiold Glacier on the Spitsbergen is an original Polish glaciologic laboratory which is of a major general significance for the development of studies of ice and snow, methodology in evaluation of the principal elements of the energy balance and the mass balance of an ice sheet surface. The Torun Station at glaciers on Oscar II Land (Northwestern Spitsbergen) has been acquiring an equal importance in the last few years.

15. Geomorphology and geology of the Quaternary. Studies in the geomorphology and geology of the Quarternary (which for many years have been Polish specialties) were performed on the broadest scale on: (a) Spitsbergen (since 1934), (b) Western Greenland (since 1937), (c) Iceland (since 1968) and to a lesser degree (d) the Antarctic region (since 1959).

a. Spitsbergen. In that area, explorations were initiated by S.Z. Rozycki (1934) in the Torell Land and continued by the expedition in Oscar II Land in 1938 (mainly by M. Klimaszewski). This research was extended by expeditions under the auspices of III IGY-IGP in Southern Spitsbergen (1957-60) by the Wroclaw group of scholars headed by A. Jahn (Hornsund-North) and the Lodz group of J. Dylik (Hornsund-South). K. Birkenmajer also worked on a number of selected problems (the succession of marine terraces and isostatic movements). In the Van Keulenfjorden area, a similar series of studies were conducted (in 1958) by the Warsaw group of S.Z. Rozycki. As a result of these studies, numerous monographic publications and general review of regional and worldwide importance were published. These studies are continuing and using increasingly more sophisticated methods. They are performed by various Polish expeditions in different parts of the Spitsbergen (Wroclaw, Warsaw, Poznan, Krakow, Lublin and other research centers).

b. Western Greenland. The first Polish explorer to conduct research in this area was A. Jahn (1937), who published a number of fundamental works of regional and worldwide significance.

c. Iceland. Work by the Torun expedition (1968) and Lodz expedition (1972) provided gradual regional expansion of the scope of research in that area. Individual work was done by Polish scientists working as members of foreign

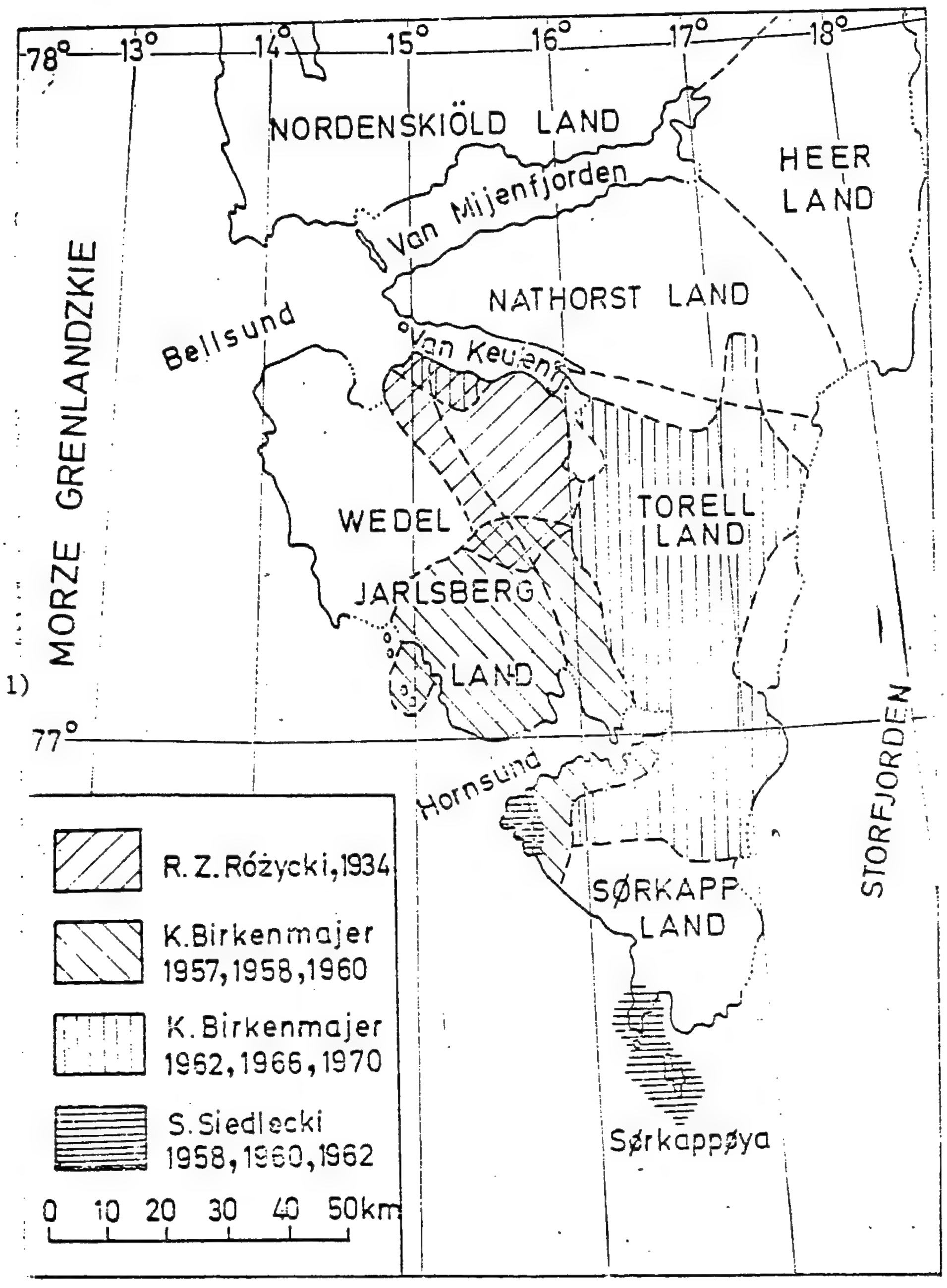


Figure 2. Spitsbergen areas encompassed in the geodetic survey, scale 1:50,000, done by Polish geologists.

Key: 1 - Greenland Sea

expeditions in Canadian Arctic regions, Alaska and Siberia, increasing the Polish contribution to periglacial studies.

d. Antarctic region. In the area of Dobrowolski Station (the Bunger Oasis), S.Z. Rozycki was the first Polish explorer to investigate the elevated sea terraces and periglacial phenomena (1958-59). These studies were continued by the expedition of 1978-79. Near the Arctowski Station, geomorphologic research and studies of the geology of the Quaternary were done by the Lodz group (1977-79, principal investigators L. Dutkiewicz, J. Jersak and K. Krajewski) and also by K. Birkenmajer (1977-81). A detailed succession of Holocene marine terraces was described and age determinations made for some terraces, moraines and volcanic forms using radiocarbon and lichenometric methods.

16. The geology of pre-Quarternary formations and paleontology. Geologic studies in a broad range (stratigraphy, tectonics, sedimentology and geologic surveys) and paleontologic research (including paleoecology) of pre-Quaternary rocks were conducted by Polish expeditions and also by individual Polish geologists taking part in foreign expeditions in the following regions: (a) Spitsbergen (since 1934) and Bear Island (since 1964) in the Svalbad Archipelago; (b) Western Greenland (in 1937) and Eastern Greenland (1971, 1976); and (c) Antarctic region (since 1976-77).

a. Spitsbergen. The first Polish geologic studies in Torell Land were conducted by S.Z. Rozycki (in 1934), who drew a geologic map of the scale 1:50,000 covering an area of about 500 $km^2$ (which until today is regarded as one of the detailed geologic maps of the Spitsbergen). He also performed stratigraphic studies of the Paleozoic and Mesozoic, describing the structure of the Tertiary folded belt.

This research was continued by the Polish expeditions in the framework of III IGY-IGP in 1957-60 (director Birkenmajer), paleontologic expeditions (1974-79), central expeditions (since 1978), as well as Torun expeditions (1978) and Krakow expeditions (1982 and 1983), which encompassed not only Southern Spitsbergen but also Central Spitsbergen (Bellsund and Isfjord) and the northwestern part of the island (Forlandsundet). The activities of Polish geologists as part of Norwegian and Polish-American expeditions encompassed the central, southern and western areas of the Spitsbergen, as well as Bear Island.

The major Polish accomplishments in geologic and paleoontologic research after World War II include: compiling the geologic map of scale 1:50,000 of Southern Spitsbergen covering a territory of over 5000 $km^2$ (which is equal to 8 percent of the entire Spitsbergen ice sheet); description of the stratigraphy, tectonics and petrogenesis of pre-Cambrian, Paleozoic and Mesozoic complexes, especially in Southern Spitzbergen; monographic work on the fossil fauna, especially of Permian radiopods and corals; description of the synthesis of the Caledonian orogenesis of Svalbard in conjunction with global tectonics; a geologic monograph on the evolution

of Svalbard; and development of a Tertiary model of the geologic evolution of the Arctic-Atlantic basin.

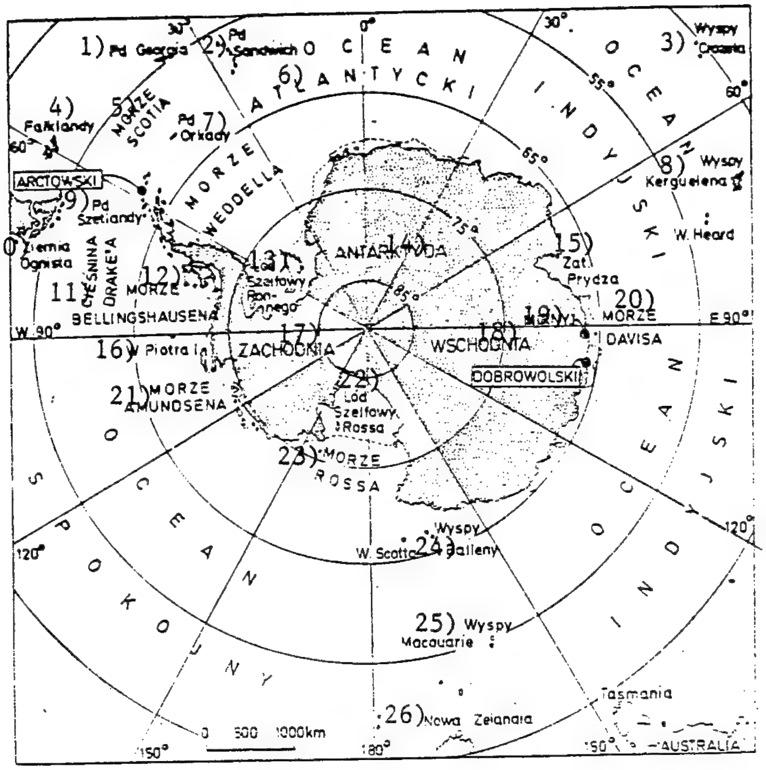

Figure 3. Locations of Polish research stations in the Antarctica: Arctowski Station (King George Island) and Dobrowolski Station (Bunger Oasis).

Key:

| | |
|---|---|
| 1 - South Georgia | 14 - Antarctica |
| 2 - South Sandwich | 15 - Prydz Bay |
| 3 - Crozet | 16 - Peter |
| 4 - Falklands | 17 - Western |
| 5 - Scotia Sea | 18 - Eastern |
| 6 - Atlantic Ocean | 19 - Mirnyi |
| 7 - South Orkney | 20 - Davis Sea |
| 8 - Kerguelen | 21 - Amundsen Sea |
| 9 - South Shetlands | 22 - Ross Ice Shelf |
| 10 - Weddell Sea | 23 - Ross Sea |
| 11 - Drake Passage | 24 - Balleny |
| 12 - Bellingshausen Sea | 25 - Macquarie |
| 13 - Ronne Ice Shelf | 26 - New Zealand |

These studies provided a basis for evaluating the mineral deposit prospects of Southern Spitsbergen and the adjacent shelf zone.

b. Greenland and Jan Mayen. Geologic (petrographic) research in Western Greenland was performed by a Polish expedition in 1973. Geologic studies in Eastern Greenland were done in the framework of Danish expeditions by K. Birkenmajer (1971 and 1976). The studies included the stratigraphy and tectonics of the Upper Paleozoic and Mesozoic formations, especially the Triassic sedimentology and compilation of geologic maps. The Teritary volcanics were investigated in Eastern Greenland and the Quaternary on Jan Mayen.

c. The Antarctic region. Geologic studies (under the direction of K. Birkenmajer) included a detailed exploration of the entire King George Island and the neighboring islands. A geologic map, scale 1:50,000, covering over 3000 $km^2$ was made. The stratigraphy was described in detail and the tectonics of the Mesozoic and Cenozoic volcanic complex determined. A new model of the geologic and geochemical evolution of the island arc of the Southern Shetland Islands was developed. Sediments with fossil Mesozoic and Cenozoic fauna and flora were discovered. The studies led to a discovery of new Tertiary glaciations in the Western Antarctic Region: Melville (Miocene), Polonaise (Lower Pliocene) and Legru (Upper Pliocene) Glaciations.

Geologic studies also resulted in the discovery of zones of increased breccia mineralization and allowed identifying zones with prospects for occurrence of hydrocarbons on the Southern Shetland Shelf. This discovery has important political and economic implications associated with Poland's participation in negotiations concerning the principles of international conventions regulating the mineral resources of the Antarctic Region.

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# MICROCOMPUTER, MICROPROCESSOR DEVELOPMENT, PRODUCTION DESCRIBED

## Private Hardware, Software Production

Warsaw INFORMATYKA in Polish No 7, Jul 84 pp 23, 24

[Interview with Ryszard Kajkowski, head of Computer Studio Kajkowski [CSK], a firm producing computers and application software, by Andrzej J. Piotrowski; date and place not specified]

[Text] [Question] You are a computer scientist with a doctorate in open studies, that is, you were planning for a career in science. However, your name is known in conjunction with your firm's activities, a firm that achieved renown by producing Lidia (a computer compatible with Apple II). The success of the computer is attested to by the fact that orders exceed CSK's production capacity for the next 3 years. What is more, you are also offering application software for microcomputers, which no one has done to date in Poland. You, however, started from nothing. What convinced you to take such a path in life?

[Answer] At a certain moment I came to the conclusion that if I wanted to develop myself I had to do something about it. And information science is probably the cheapest way to do it.

[Question] With regard to an investment?

[Answer] Yes. In 1980 I was able to buy an Apple microcomputer cheaply. I then began to think what to do with it. That was the beginning.

[Question] Did you try working for a state enterprise?

[Answer] I did. I worked for 3 years at a large computer center as a systems designer. I left when the decline of information science in the state enterprises became quite obvious, but not because of the themes the enterprises are involved with. Unfortunately, the specifics of these enterprises are such that initiative is squelched. There simply is no opportunity for development.

[Question] Then you went into business on your own initiative.

[Answer] After much difficulty I got permission from the MHWiU [Ministry of Domestic Trade and Services] to provide a service related to software. Since I

received a contract from the FRG to develop software for a microcomputer, I had to create the formal foundations. While fulfilling the contract, I realzied that because of the indigenous underdevelopment of microcomputer technology, hardware rather than software is the basic problem. I had no other alternatives; I had to create the tools myself in order to produce software in the future. I then established a craft firm to produce microcomputers.

[Question] Many computer scientists share your frustration regarding work in state enterprises. However, most of them fear risk. What is the real attitude of officials to initiatives such as yours?

[Answer] I encountered very extreme cases. At the lowest level, I was able to overcome the hurdles thanks only to the understanding of the Tczew City Administration. At the provincial level, I was treated very cooly; they did not comprehend, the subject matter was included in their nomenclature or tables of services. However, at the highest level, at the MHWiU, the subject was neither given special priority nor restrained. There was even discreet interest as to how it would work out. At the Department of Crafts, the road was already clear; after all, I had a ready product, and an exportable one at that.

[Question] Domestic supplies of microcomputers come primarily from private firms (Polonia or craft). The demand for these products greatly exceeds supplies. Why do not the private firms, which by nature are very flexible, increase production to satisfy this demand?

[Answer] Peripheral equipment is the basic problem in the production of microcomputers. They hinder my enterprise and some of the Polonia firms as well. Disk drives, monitors, keyboards and printers are practically unavailable on the Polish market. The manufacturer of printers does not even want to start discussions before 1985, and MERA-KFAP (the disk drive producer) in general does not reply to any kind of inquiry...

[Question] But this equipment is also produced in other CEMA countries: the GDR, Hungary, Bulgaria...

[Answer] Of course, but in principle private firms are not considered in the central distribution of imported equipment. But this is not the biggest error of the central authorities concerning imports. They analyze demand that in practice is nil because supplies are lacking. If a question concerning needs is directed to a large producer, the answer given is that it depends on the enterprise's possibilities. Thus, import is small and the circle of nonsense goes on and on.

[Question] Could it be that this absurdity has its own broader base?

[Answer] Unfortunately, the public is unaware of the microcomputer problem in Poland. Worldwide, 80 percent of the microcomputers are bought by purchasers that are not large firms: private individuals, stores, schools and universities.

[Question] Then it is a market product that in our situation can attract a significant part of the "idle" money.

[Answer] That is understandable. The current price bears no relation to incurred costs, and it could be said that it could be maintained in Poland. The demand is already quite large, and it is the younger generation that is especially interested.

[Question] Production by the large state enterprises is thwarted, doubtlessly, by the relatively small amount of foreign exchange that would be received from the export of microcomputers. In addition, we are a bit late in this field.

[Answer] It is probably more a lack of flexibility in thinking. Right now the decision is in the hands of the "equipment people." But it is difficult to convince them that information science can earn foreign exchange by producing, for example, containers for disks. I submitted a proposal to a state enterprise: make casings for computers and monitors and in return you will receive microprocessors. You can receive a microprocessor for a casing! The simple truth, however, is beyond the limits of perception of the decisionmakers. How could such an important electronics enterprise, created for the Great Information Science, be concerned with such a banal issue as casings? The production of microcomputers cannot be accomplished by hobbyists and students; it is an industry in itself that should not be driven by ambition but by discernment and common sense. It is very difficult to sell computers to the West. It is much easier to enter into a cooperative venture.

[Question] Could not the relatively large hobbyist movement pressure the decisionmakers to make specific moves?

[Answer] That is very difficult because in our country pressure from below must be of the institutional form. It must use the press or some kind of social organization associated with information science. In addition, the pressures do not affect the decisionmakers in a way that is suitably strong, and this engenders mistakes at the administrative level, mistakes that produce the worst results. But it is probably worthwhile to expand training, making it possible to promulgate the so-called information science consciousness. Then, perhaps, the decisionmakers will finally understand that popularizing the microcomputer is in their own interest as well.

[Question] Could it be they also fear this new technology because it exposes incompetence unmercifully?

[Answer] In the case of microcomputers, elimination is possible via programmers. Applying utility programs does not require information science training (this is a very important psychological aspect). Of course, the older generation with its old habits will not willingly adapt to all innovations. But young people equipped with new tools will assume the lead in accelerating the process of replacement of cadres in a mild and perhaps even a dramatic form.

[Question] But where will these tools be obtained?

[Answer] Of course, the microcomputer information science problem in Poland is not limited to hardware. There is also the legal problem and the use of financial facilities and credits. Satisfactory results can be achieved only if the problem can be considered in its entirety. Microelectronics is being advocated all over the world via appropriate government programs.

[Question] Of course, but in Poland the authorities are not interested in advocating microinformation science.

[Answer] Not entirely. Some projects at the Institute of Information Science Essentials are being conducted on the basis of government orders. But the problem here is that the awareness of the decisionmakers is limited basically to large computers. A cadre does not yet exist that is familiar with the microcomputer phenomenon. Thus, decisions are being made that are not suitable for today's microelectronics. For example, there are programs related to the electronization of medicine that are based on specialized equipment whose requirements are especially severe, equipment that is produced one item at a time. The ideas are useful, except that mass electronics cannot be based on specialized applications. On the contrary, the development of mass electronics can create the conditions for applying it to specific areas.

[Question] Since we are talking about massiveness, the myth of a Polish microprocessor remains in Poland. It is a myth because it is being produced in numbers that are far from massive.

[Answer] Practically the whole world contributed to the success of the Apple Computer Company, both its software and hardware. Such decisions at the appropriately high levels that would permit needed subassemblies to be produced must also be encouraged in Poland.

[Question] But we do not have the money to make purchases.

[Answer] But the economy should not be based exclusively on the mines. In order for us to make purchases, we must produce in a modern way, which cannot be done without microcomputers. We should invest in microelectronics in the interest of all branches of the economy. Then we will be able to sell our products on the basis of sound costs. Right now we are too poor to make mistakes. The question is not whether we should or should not do it. We must do it!

[Question] Otherwise we will fall further behind in the world...

[Answer] And very quickly at that. Presently technological changes are visible every few months. Computers are now being used to design other computers; this is geometrically accelerating progress. From this we must realize that we have no other choice.

## Development of Microprocessor Technology

Warsaw INFORMATYKA in Polish No 7, Jul 84 pp 24-26

[Article by Janusz Zalewski: "Microprocessors in Poland"]

[Text] The most recent conference on microprocessors entitled "Microprocessors: Their Status and Applications Prospects in Poland" was held from 18-19 October

1983 in Kolobrzeg.[1] It was organized by the Wielkopolska Chapter of the Scientific Society of Organization and Administration of the Poznan Chapter of the NOT [Chief Technical Organization] Committee on Information Science. Thirteen problem papers and several dozen reports concerning many problems that are of importance in the development of microprocessor technology and its applications were presented at the conference.

Deliberations were conducted simultaneously in two thematic sections:

--hardware, software and systems;
--applications.

In what follows, I am modifying this division somewhat, singling out in addition a group of papers that are of more general significance.

Systems

I have attempted above all to focus attention on design accomplishments, but there were very few new accomplishments. One worthy of note that I was unaware of previously was the controller, based on a single-chip microcomputer, that was produced by Gdansk Polytechnic's Institute of Electronic Technology. It was available in two versions: a universal one meant for control-measurement applications (J. Gajkiewicz and others), and a specialized one to test integrated circuits (A. J. Majewski). The other designs (controllers or configurations) that were presented are, in general, known to our readers (for example, see K. Rzymowski, INFORMATYKA No 2, 1983). Thus, significant progress in this area was not noticeable in comparison with, for example, the designs presented in last year's issue of INFORMATYKA devoted to microprocessors.

Some new work is being done on systems, for example, buses for a multiprocessing system (M. Domzalski, Lodz Polytechnic Institute of Information Science) and the structure for a microprocessor system (J. Jaworowski, J. Zaczek of the AGH [Academy of Mining and Metallurgy] Institute of Information Science). However, they are research-type designs, and I believe their utility will depend to a great extent on conforming knowingly with world standards in this area.

In the development of software for Polish microcomputers, one still cannot detect a general concept, and I believe that we need such a general concept. From this viewpoint, the most interesting phenomenon of the conference was the software developed for the PSPD-90 microcomputer, which represents an unquestionable event in our market because it came into being as a result of the programmed data processing station produced by the KFAP [Krakow Measurement Apparatus Plant] (based on the 8080 microprocessor). The MINOS operating system developed at the UJ [Jagiellonian University] Institute of Information Science (K. Jojczyk and M. Kubowicz) was presented at the conference. The authors' ambition is to create a complete but minimal programming center for the microcomputer. In addition to the named components, the PSPD-90's basic programming also includes a text editor, a macroassember, a consolidator, a

[1] We discussed the previous national conferences on this subject in INFORMATYKA No 2, 1981 and No 4, 1983.

librarian and a start program (patterned in part on the appropriate tools for the RT-11 operating system). A serious limitation in realizing the system's goals and aims is the computer's inherent shortcomings, such as the deficient interrupt service and the small operating memory capacity.

A characteristic of the program product that is designed for possible distribution is that it contains only one packet--floating point arithmetic for the Z-80 microprocessor and, in the assumptions, for the MCY7880 (A. Jedrzejewski, Warsaw Polytechnic Industrial Training Center for Metrology and Measuring Systems). But the author does not say if his method of representation is in accordance with an international standard, for example, with the Intel or IEEE standard, which is very important.

Relatively speaking, most of the papers concerned problems related to designing and implementing microprocessor systems. The following were also discussed: specific equipment to implement and test software packages, for example, those based on the signature analysis method (E. Michta, Zielona Gora WSI [Higher School of Engineering]); and complete configurations to start microcomputers, for example, emulators for the known MSWP [Computer-Aided Design System] (L. Naumowski, Institute of Mathematical Machines).[2] Several papers on aids to software generation were also presented. The activity of the workers of the UJ Institute of Information Science was manifested again in the attempts to use the PSPD-90 microcomputer to strengthen the programming centers for other computers (W. Burczyk, K. Jojczyk). The PSPD-90 has been used for a long time in the simplest way as a data preparation station, that is, off-line. The use of this station as an intelligent terminal interfaced with a transmission line computer in accordance with, for example, V.24 is a significant advance in this station's capabilities. The use of this station to generate software for personal computers, such as the ZX-81 or ORIC, will also be another step toward the more extensive use of this station.

The work being conducted on the COSMIC system at the Poznań center (K. Kurpinski, Poznan Polytechnic Center for Information Science) is aimed at creating complete software for microcomputers. Based on the ODRA-1305 with a GEORGE-3 operating system, a set of programs was developed (including an assembler, simulator and a start program) to generate software for the 8080 (MCY 7880N) microprocessor.

The significance of organizing the entire process for designing and implementing microcomputer systems and the role of tools in this process were emphasized in two different papers (A. Skorupski, J. Sosnowski of the Warsaw Polytechnic Institute of Information Science), in which many phases whose proper progress is vital for developing a system were differentiated. They are:

--formulating the technical assumptions;
--designing the hardware and software and realizing a model;
--implementing, testing and optimizing the system (preparing a prototype).

It was stated that specific progress is being made in the area of resources to aid the final stages of this process, especially with regard to analysis and

[2] T. Sinkiewicz: "A Microprocessor System to Aid Design," INFORMATYKA No 1, 1983 pp 8, 9.

emulation equipment. Although the authors did not present at the conference any of the equipment developed by them (see INFORMATYKA No 2, 1983 p 17 and No 6, 1984 p 6), attention should be paid to these papers because they are examples of a very logical approach to organizing the process for designing computerized equipment.

Basic Problems

The discussion on current world trends in computer system architecture was an interesting setting for the individual talks that followed (M. Marczynski, PAN [Polish Academy of Sciences] Institute of Information Science Essentials). The current research projects being realized mainly in the United States and Japan concern:

--high order languages (HOL);
--very high speed integrated circuits (VHSIC);
--fifth generation computer systems;
--multiproject chips (MPC).

Each of these projects is planned on a massive scale and is characterized mainly by the immense financial resources being expended on it, but thus far only one has been completed. It is difficult to see any evidence of these trends on a Polish scale. The lack of money is not the only factor hampering the realization of such tasks--I cannot think of a single large enterprise in the field of information science that is organized efficiently in Poland.

The paper on the influence of microprocessors on expanding the computing power of computers and the rise of local area networks (LAN) (A. Goscinski, AGH Institute of Information Science) to a great extent supplemented the previous papers and expanded the outlook of the average computer user on the development of computer system architecture. This paper affirmed the earlier perception that the scope of the complication of the equipment used to interface computers with a network will be a formidable barrier to the development of this technology in Poland. Furthermore, it is not clear which one of the drafts of standards, the IEC PROWAY or the IEEE P-802, will prevail, even though it now appears that both specifications are beginning to converge.

The review of world trends in software for microcomputer systems (J. Madej, Warsaw University Institute of Information Science) was as meaningful as the last review, but not because newer methods for generating software are being used elsewhere. It was sufficient to repeat that software should be "needed (!), faultless, cheap, easy to use, portable and reliable." Also, an interesting perception is that because of the large-scale character of new technology, software is not generated only by specialists; amateurs are also writing software more and more, and this software is not distributed to a limited circle of users. Even children are using it more and more.

In contrast to previous conferences on microprocessors, this time the authors and organizers did not neglect theory. Papers concerning theory were presented primarily by the representatives of the Poznan center and encompassed the entire scope of the conference's themes, from problems of configuration, for example, memory organization and selection (G. Bartoszewicz), through basic

software problems (J. Koperski) and the generation of utility programs (B. Mikolajczak), to problems concerning the integration of software and hardware structures in designing computer systems (Z. Liszynski). In this class of papers I would also include the papers from the Krakow center on languages for programming multiprocessing systems and on a generator of syntax analyzers for specialized languages. However, to tell the truth, it is difficult for me to determine the worth of these papers, I believe that making the conference attendees aware of other matters besides TTL (transistor-transistor-logic) voltages and individual bites most certainly did not harm them.

Applications

Most of the papers on applications were review papers. In measurement technology (for example, A. Sowinski, Industrial Institute of Electronics) the design of devices using microprocessors is now quite ordinary. With a built-in microprocessor, a voltmeter's measuring capabilities are increased significantly so that in addition to voltage, current and resistance measurement, amplification or attenuation can be measured and other operations can also be accomplished, such as sorting measurement results within various boundaries, detecting values exceeding limiting values, remembering readouts, calibrating and the like. Digital oscilloscopes supply numerical data of a similar nature. Nonetheless, the development of apparatus equipped with microprocessors is still in its infancy, especially in Poland. On the other hand, many potential users of this apparatus are not informed about their possibilities.

In another paper (P. Refermat, Institute of Organization and Administration of the Poznan Academy of Economics), the automation of offices using microprocessors was discussed with special attention being paid, among other things, to the importance of local computer networks in these applications. The possibility of using microprocessors in automation, to realize digital regulators and filters, in analyzing the merits of this technology for specific types of microprocessors was also discussed (A. Kasinski, W. Bajsert, Poznan Polytechnic Institute of Automation).

Once again I must report with regret that there was a lack of papers on the application of microprocessors in telecommunications (even though they were requested). They would have been of interest if for no other reason than that some knowledge about the developments in this area in Poland would be desirable. This type of application is quite specific and is characterized by the existence of special requirements greatly affecting the nonstandardization of hardware and software.

Other rarely discussed applications, however, were presented, namely the use of microprocessors in the didactic process (F. Wagner and others, Zielona Gora WSI). The microcomputer laboratory, using four cassettes controlled by 8080A or Z-80 microprocessors and connected to an SM-3 computer, is a sufficiently complex but functional configuration on which many exercises to teach microprocessor technology can be realized. These same authors also described (only at the conference, I believe) the production of equipment with a built-in microprocessor controlled by a KL-2 recorder. This kind of application, that is, microprocessor-equipped products, is testimony to progress and should be the essence of the development of this technology in Poland.

* * *

What can be said, based on the conference proceedings, about the status and prospects of this technology in Poland? The organizers claim that "to date the development of microprocessor technology in Poland is slow, though in many areas it is pronounced and, what is more important, it is systematic... There is an urgent need to develop a standard design base to build microprocessor systems that are mechanically, electrically and logically compatible. It is necessary to shorten the equipment design and execution cycle, to improve their reliability and to assure proper maintenance conditions. This would create the conditions to build more complex multiprocessor systems or microcomputer networks. It also is necessary to increase outlays for software (...)" The list of these "necessities" could be long. I wrote about this in the reports of previous conferences, and it would make no sense to repeat them.[3]

The opinions of some of the speakers regarding problems of a more general nature that can hamper progress should be mentioned. They are:

--the shortage of 16-bit and segmented microprocessors which is hampering the development of applications in telecommunications and information science;

--the dependence on a microprocessor monoculture, even though many designers are pleased that this Polish microprocessor finally exists;

--the dilemma as to what should be taught in the schools: that which is now being used or that which has a future;

--the lack of standardization for connectors, software packages, disks and interfacing devices, and no plan for the future in the area of research directions, which is probably hampering progress most of all.

In summary, a comprehensive and final answer to the question of the status and prospects of microprocessor technology in Poland cannot be given because of the lack of reports by producers (almost all the papers were submitted by scientific centers). However, similar conferences should continue to be organized if for no other reason than to keep oneself informed about some of the barriers along the road that others are traveling at a faster pace than we are.

## National Firefighting Computer System

Warsaw KURIER POLSKI in Polish 9 Aug 84 p 6

[Article by Slawomir Bawarski: "Fires Will Not Win Against the Computer"]

[Text] Each day the duty officer at Warsaw's fire department receives several dozen telephone calls. Fortunately, most fire alarms are not serious. But the number of excursions related to automobile accidents, where it was necessary to cut through an auto's metal to extricate the injured, has increased lately. In addition, the chemical section's workload has increased. To coordinate

[3] See J. Zalewski: "In an Industry Without Changes," MERA BIULETYN TECHNICZNO-INFORMACYJNY No 1, 1984.

all these activities, a computer was put in operation not too long ago to aid Warsaw's firefighters.

This is one of the most modern computer systems installed in a fire department not only in Poland but in Europe as well. The experiences gained in London, Paris and Moscow were taken into account. Preparations for this complicated operation took several years. First of all, it was necessary to install a telex in each branch to improve the system of communications.

The system is based on the Polish-made SM-4A computer produced by the Minicomputer Systems Enterprises. Its software is an equally important matter. This pioneering work was undertaken by Mieczyslaw Tobolski. The data bank he created contains information on:

--all fire department vehicles and units;

--the streets of Warsaw and the roads in the province, as well as instant information about road work and bypasses;

--structures such as industrial plants, hotels, movie houses, theaters, institutions and monuments. A brief description of each structure is provided: type of material from which it is built, the type of emergency exits, and what fire units should be sent on the first alarm;

--the forest areas, including Puszcza Kampinoska.

On command, the computer system also provides instant data on the kind of poison the fire brigades will have to deal with at an accident location. Till now, the firemen had to telephone the Central Station for Chemical Rescue in Plock. All of this information can be transmitted automatically to the place of action.

In addition to the tasks in their own region, Warsaw's fire brigades are also obligated to help extinguish large fires in industrial plants anywhere in Poland. The computer system will also be very useful in this situation, and in the converse situation Warsaw can expect outside help.

The computer is located on Krzywicki Street, and six monitors are installed at the Headquarters of Warsaw's Fire Department on Unia Lubelska Plaza. Its operation is very simple. Upon pressing the proper keys, the duty officer receives the proper information instantly. For example, if an alarm is received that the Hotel Forum is burning, all of its technical data is displayed on the monitor: its construction material, emergency exits, the number of stories, the type of units and equipment that should be sent first, and the quickest route to get to the fire.

The reliability of the entire computer system will be verified this year. Nontheless, we wish Warsaw's fire brigades will have as little need as possible for the system.

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